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Subsea Wire Saw User's Manual

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E.H. Wachs Part No. 08-051-MAN
Rev. 1-0709, July 2009

Revision History:
Original March 2009
Rev. 1 July 2009

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Chapter 1

About the Subsea Wire Saw

PURPOSE OF THIS MANUAL

This manual explains how to operate and maintain the subsea wire saw. It includes instructions for set-up, operation, and maintenance. It also contains parts lists, diagrams, and service information to help you order replacement parts and perform user-serviceable repairs.

Before operating the subsea wire saw, you should read through this manual and become familiar with all instructions.

HOW TO USE THE MANUAL

This manual is organized to help you quickly find the information you need. Each chapter describes a specific topic on using or maintaining your equipment.

Each page is designed with two columns. This large column on the inside of the page contains instructions and illustrations. Use these instructions to operate and maintain the equipment.

The narrower column on the outside contains additional information such as warnings, special notes, and definitions. Refer to it for safety notes and other information.

In This Chapter

PURPOSE OF THIS MANUAL

HOW TO USE THE MANUAL

SYMBOLS AND WARNINGS

MANUAL UPDATES AND
REVISION TRACKING

EQUIPMENT DESCRIPTION

Throughout this manual, refer to this column for warnings, cautions, and notices with supplementary information.

SYMBOLS AND WARNINGS

The following symbols are used throughout this manual to indicate special notes and warnings. They appear in the outside column of the page, next to the section they refer to. Make sure you understand what each symbol means, and follow all instructions for cautions and warnings.



WARNING

A WARNING alert with the safety alert symbol indicates a potentially hazardous situation that **could** result in **serious injury or death**.



This is the **safety alert symbol**. It is used to alert you to **potential personal injury hazards**. Obey all safety messages that follow this symbol to avoid possible injury or death.



CAUTION

A CAUTION alert with the safety alert symbol indicates a potentially hazardous situation that **could** result in **minor or moderate injury**.



CAUTION

A CAUTION alert with the damage alert symbol indicates a situation that **will** result in **damage to the equipment**.



This is the **equipment damage alert symbol**. It is used to alert you to **potential equipment damage situations**. Obey all messages that follow this symbol to avoid damaging the equipment or workpiece on which it is operating.



IMPORTANT

An IMPORTANT alert with the damage alert symbol indicates a situation that **may** result in **damage to the equipment**.

NOTE

This symbol indicates a user note. **Notes** provide additional information to supplement the instructions, or tips for easier operation.

**NOTE**

A NOTE provides supplementary information or operating tips.

MANUAL UPDATES AND REVISION TRACKING

Occasionally, we will update manuals with improved operation or maintenance procedures, or with corrections if necessary. When a manual is revised, we will update the revision history on the title page.

You may have factory service or upgrades performed on the equipment. If this service changes any technical data or operation and maintenance procedures, we will include a revised manual when we return the equipment to you.

Current versions of E.H. Wachs Company manuals are also available in PDF format. You can request an electronic copy of this manual by emailing customer service at sales@ehwachs.com.

EQUIPMENT DESCRIPTION

The subsea wire saw is designed to cut submerged pipe of varying materials and thicknesses. The machine operates on hydraulic power, and is controlled remotely using the Wachs topside control panel (TCP).

The saw uses a continuous-loop diamond cutting wire and a hydraulic feed system that advances the cutting wire through the pipe. Using a wire rather than a blade provides more reliable cutting on varied pipe materials, and helps avoid binding of the cutting mechanism if the pipe bends and pinches while the saw is engaged.

The subsea wire saw has three hydraulic drive circuits:

- Cutting drive: operates the drive wheel that drives the cutting wire.
- Feed drive: operates the bow holding the wire drive system, to feed the wire through the pipe and retract the bow when finished cutting.
- Clamp drive: operates the clamping arms that secure the machine to the pipe during cutting.

**NOTE**

The model name indicates the pipe size capacity. The first two digits are the largest pipe, and the second pair of digits is the smallest. For example, the WS-3616 saw will cut pipes from 16" to 36" (406 to 914 mm) O.D.

Separate controls and gauges for each circuit are provided on the TCP, described later in this chapter.

Subsea Wire Saw Models

Various wire saw models are available, each designed to cut a range of pipe sizes. The only significant difference in the models is size; all operate in a similar manner. The following table lists the models and capacities.

Table 1: Subsea Wire Saw Models

Model	Min. Pipe Capacity	Max. Pipe Capacity
WS-3012	12" (305 mm)	30" (762 mm)
WS-3616	16" (406 mm)	36" (914 mm)
WS-5230	30" (762 mm)	52" (1321 mm)

Cutting Wire Drive System

The cutting wire drive system consists of four wheels mounted on the bow of the machine. Figure 1-1 illustrates the drive system components.

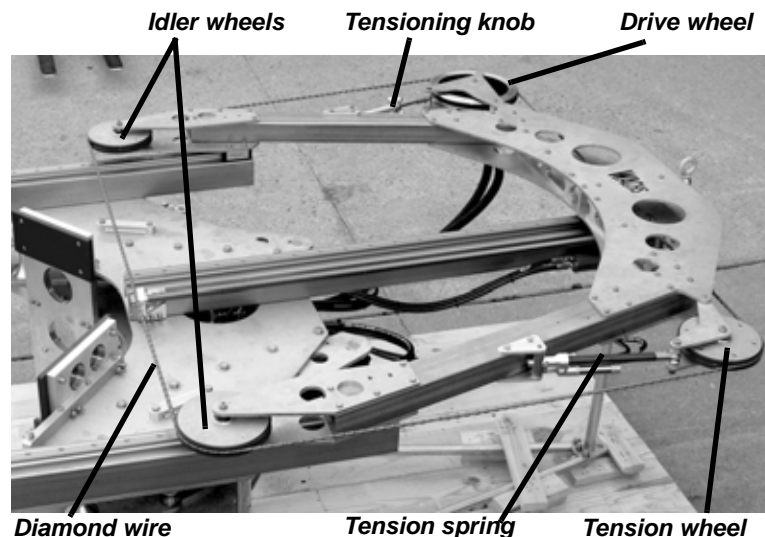


Figure 1-1. The photo shows the cutting wire drive system components.

The drive wheel is operated by the hydraulic drive motor to turn the wire around the cutting system loop. It is mounted on a pivoting fixture used to adjust the tension of the wire. The tension is set using a knob on the fixture, which also positions the wheel for installing and removing the cutting wire.

The tension wheel is on a pivoting, spring-loaded fixture that maintains wire tension. The other two idler wheels are fixed at the bottom of the bow where the cutting wire engages the pipe.

The wire is a custom-made loop for the size of the saw. Spare wires can be ordered from E.H. Wachs.

Feed System

A feed drive mechanism on the main frame of the machine drives the bow and cutting system up and down to perform the cut and retract the bow after cutting. The bow rides on three feed rails and is driven by a feed screw in the center of the frame. Figure 1-2 and Figure 1-3 show the main feed system components.

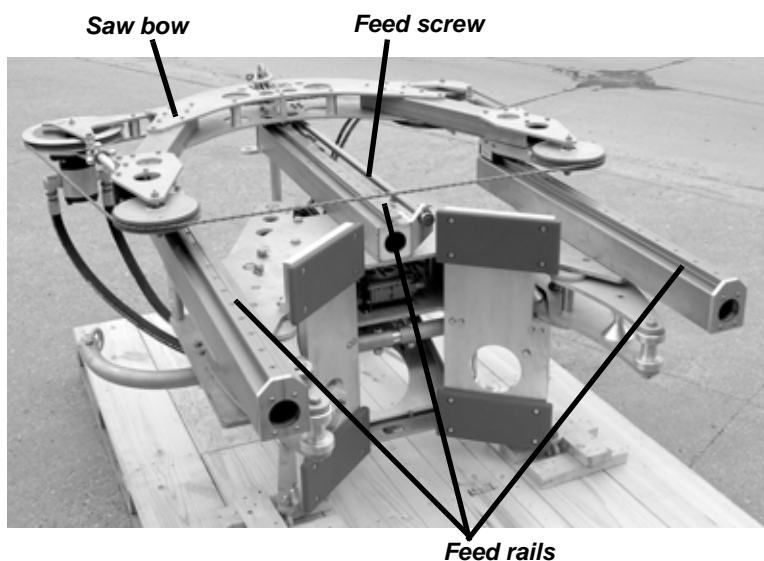


Figure 1-2. The saw bow moves on three feed rails on the frame. The feed screw along the center rail drives the bow.

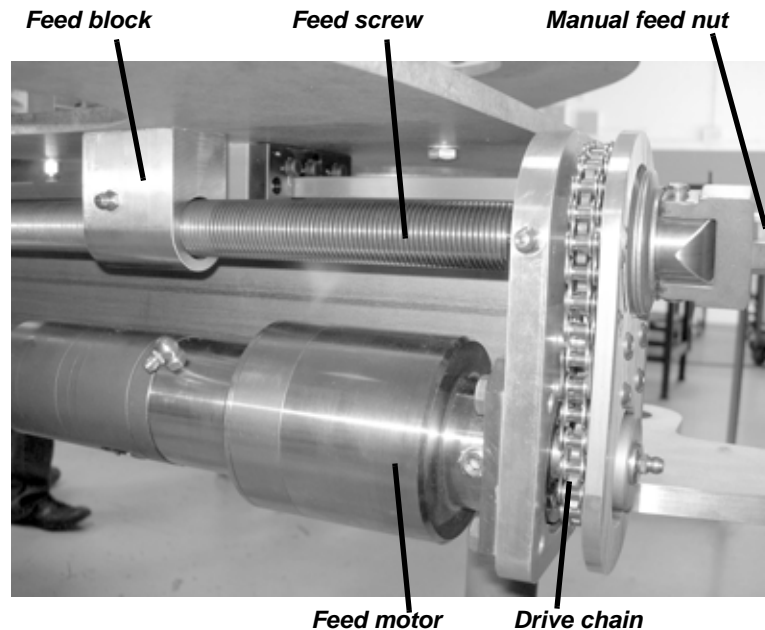


Figure 1-3. The feed system components are shown. The feed block is attached to the saw bow.

The top of the feed screw has a drive nut to allow the feed to be operated manually, and a clutch in the top coupling disengages the feed screw if the feed drive jams or reaches the end of travel.

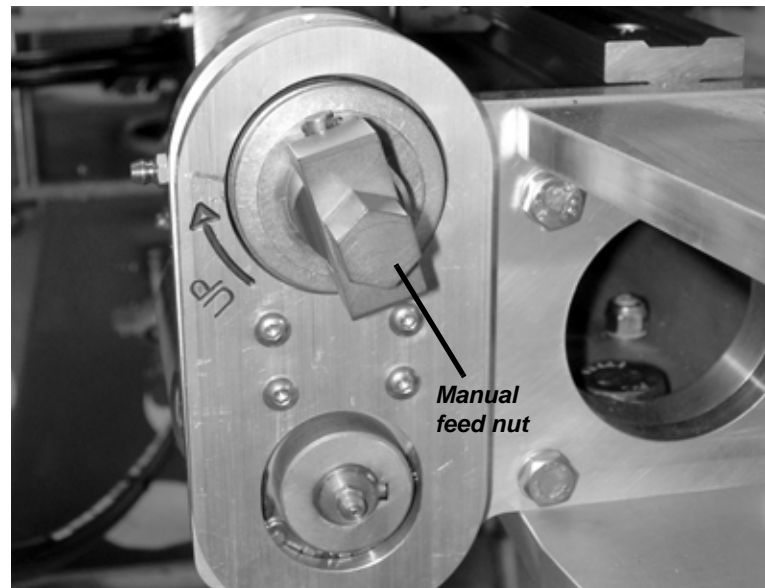


Figure 1-4. Use the manual feed nut to move the saw bow if it cannot be operated using hydraulic power. Turn the nut clockwise to retract the bow away from the workpiece.

The feed system has a self-adjusting speed control feature. A hydraulic actuator on the tension wheel fixture measures the deflection of the wire as it cuts. If the feed speed is too fast, the increased wire deflection trips the actuator, which slows down the feed rate. This allows the cutting action of the wire to catch up. At maximum deflection of the wire, the actuator will stop the feed motion for as long as necessary.

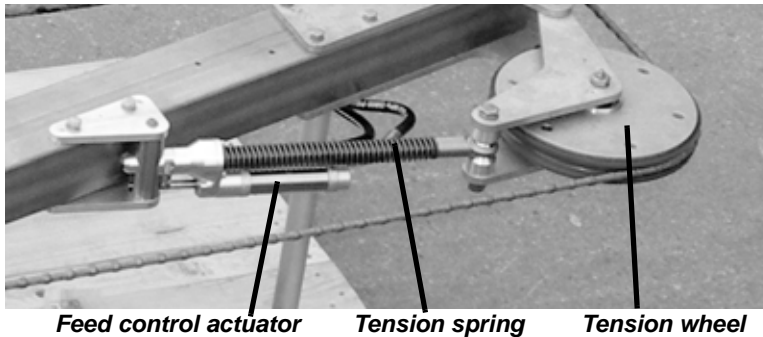


Figure 1-5. The actuator controls the feed rate by measuring the deflection of the cutting wire.

Clamping System

An adjustable clamping system allows you to configure the machine for pipe sizes within each model's range. The two clamping arms are attached to the main frame with two-pronged forked pins that are removable to reposition the arms.

The clamping arms are engaged by hydraulic cylinders mounted to the frame. When the cylinder rods are extended, the clamps pivot inward to grip the underside of the pipe and hold the machine securely to it. Figure 1-6 illustrates the clamping operation.

See the end of this chapter for drawings that illustrate clamp position settings for the range of each wire saw model.

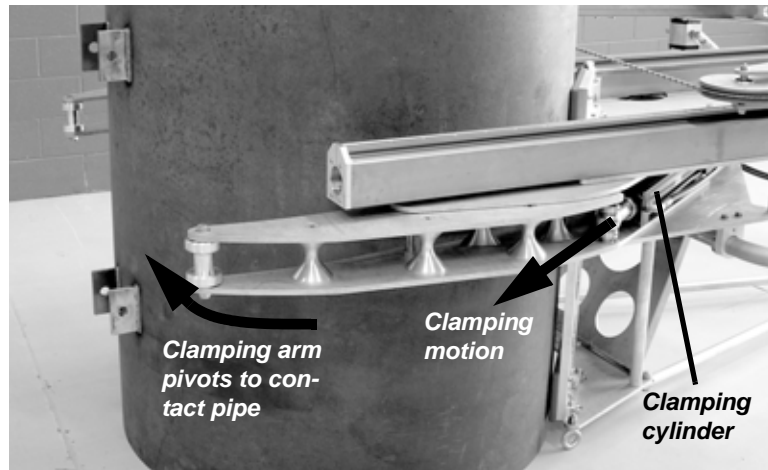


Figure 1-6. The photo shows the wire saw in position for clamping on a test workpiece. When the hydraulic cylinder is extended, the clamp arm pivots and closes on the pipe. Both clamping arms operate together.

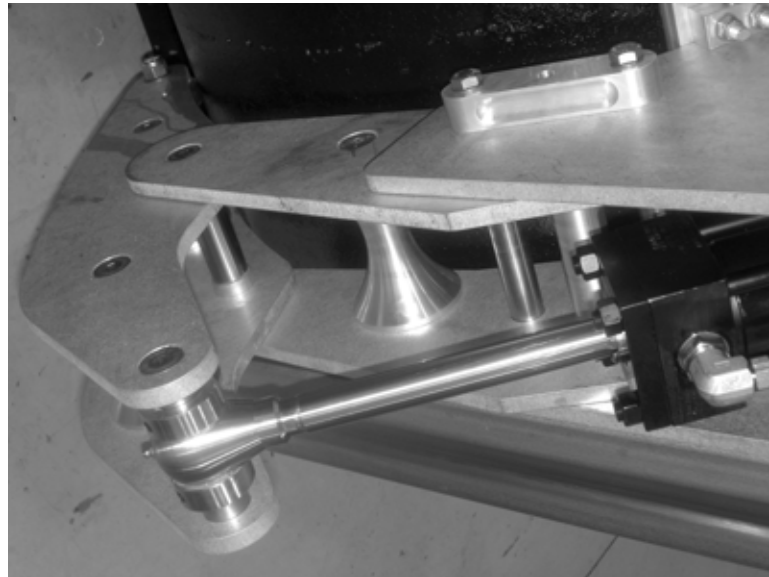


Figure 1-7. The photo shows the clamping cylinder extended and the clamp arm secured against the pipe.

The frame of the machine has clamp shoes attached that the machine rests upon when installed on the pipe. These shoes are made of a compressible composite material that deforms slightly under pressure to create a secure, slip-free grip on the pipe when the machine is clamped.

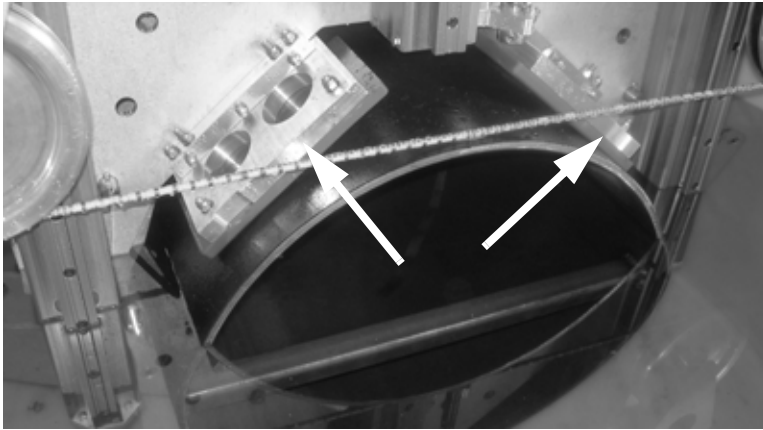


Figure 1-8. The front mounting shoes are shown.

Topside Control Panel

Figure 1-9 illustrates the controls used to operate the subsea wire saw. Chapter 3 includes detailed instructions.

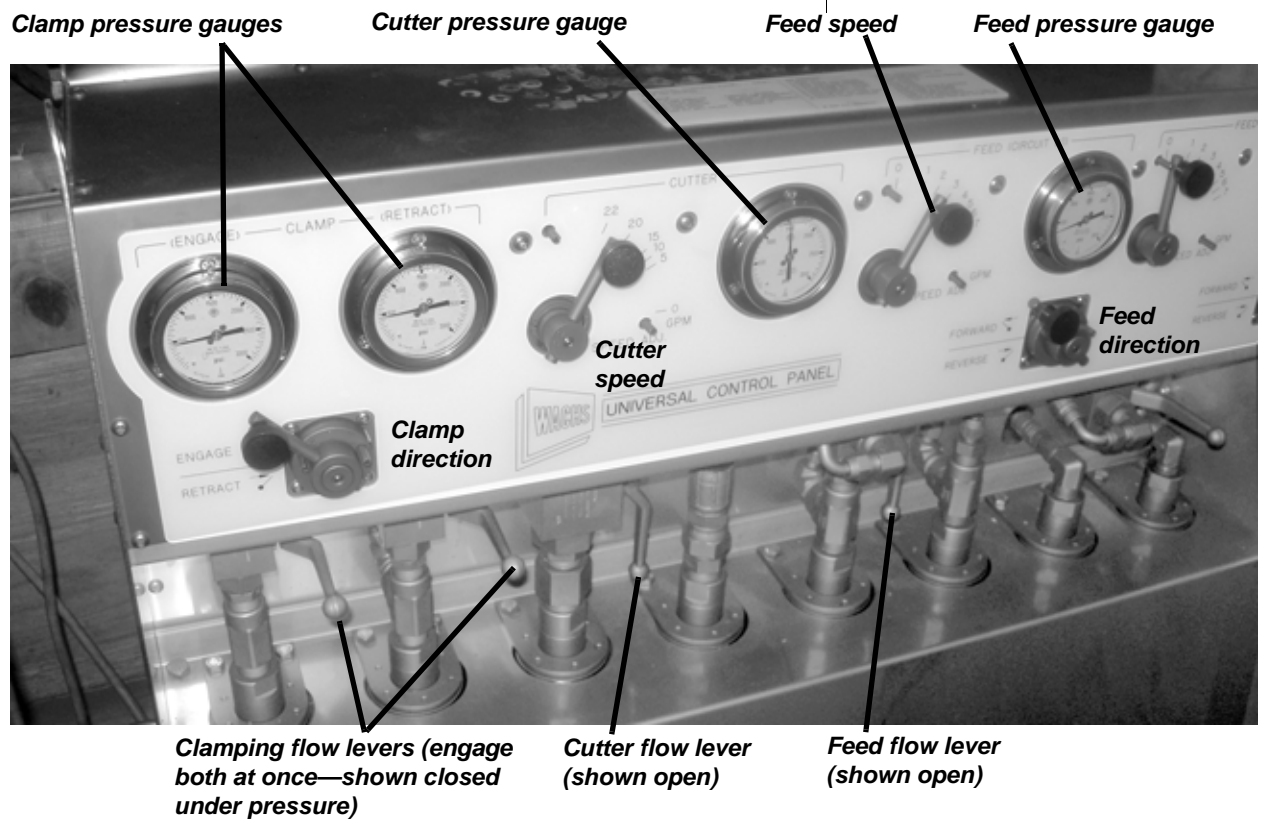


Figure 1-9. The photo shows the controls on the topside control unit. (The fourth circuit, to the far right, is not used with the subsea wire saw.)

Rigging the Machine

A rigging instruction label is attached to the top of the machine frame.

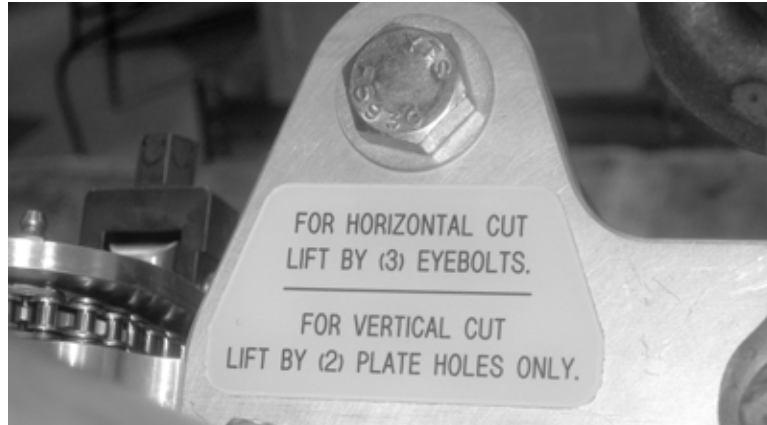


Figure 1-10. The rigging label is on top of the frame.

Lifting for Vertical Cut

Attach the machine to the lifting device using chains on the top lift hooks. Tip the machine up to a vertical position, then pick it up. Make sure the chains are the appropriate length to hold the machine reasonably straight.

IMPORTANT: Do not attach to this hook when lifting the machine vertically!



Figure 1-11. To position the machine vertically on the pipe, attach to the two top lift hooks.

Lifting for Horizontal Cut

With the machine positioned horizontal on the floor or deck, attach a lift to the two hooks on the lift bar and the front hook on top of the frame.

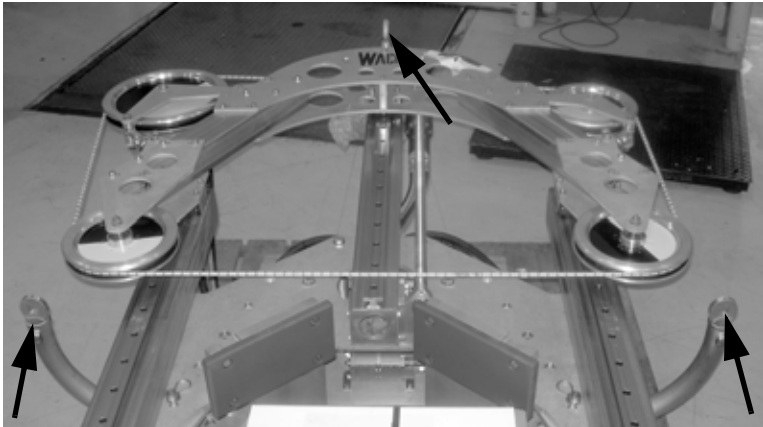
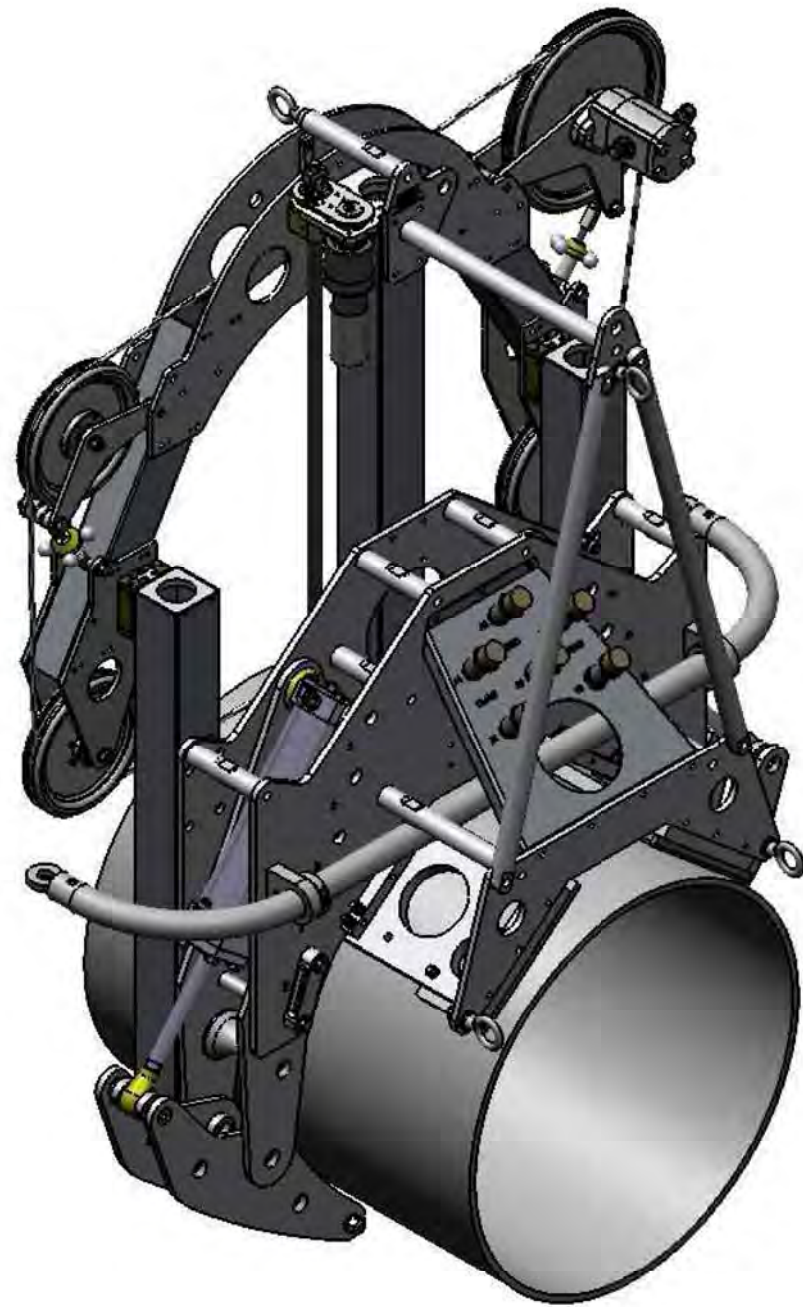


Figure 1-12. To position the machine horizontally on the pipe, attach to the two lift bar hooks and the front hook on the top.

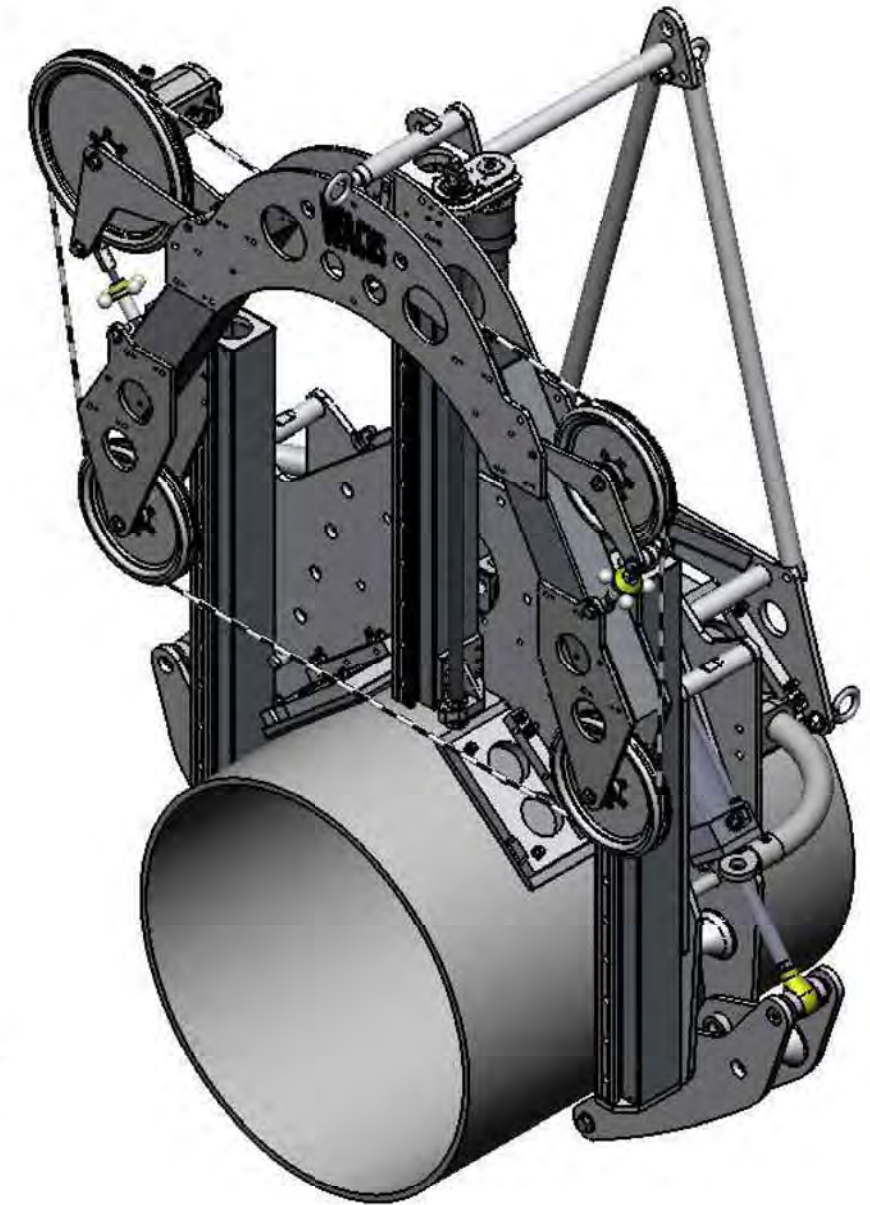
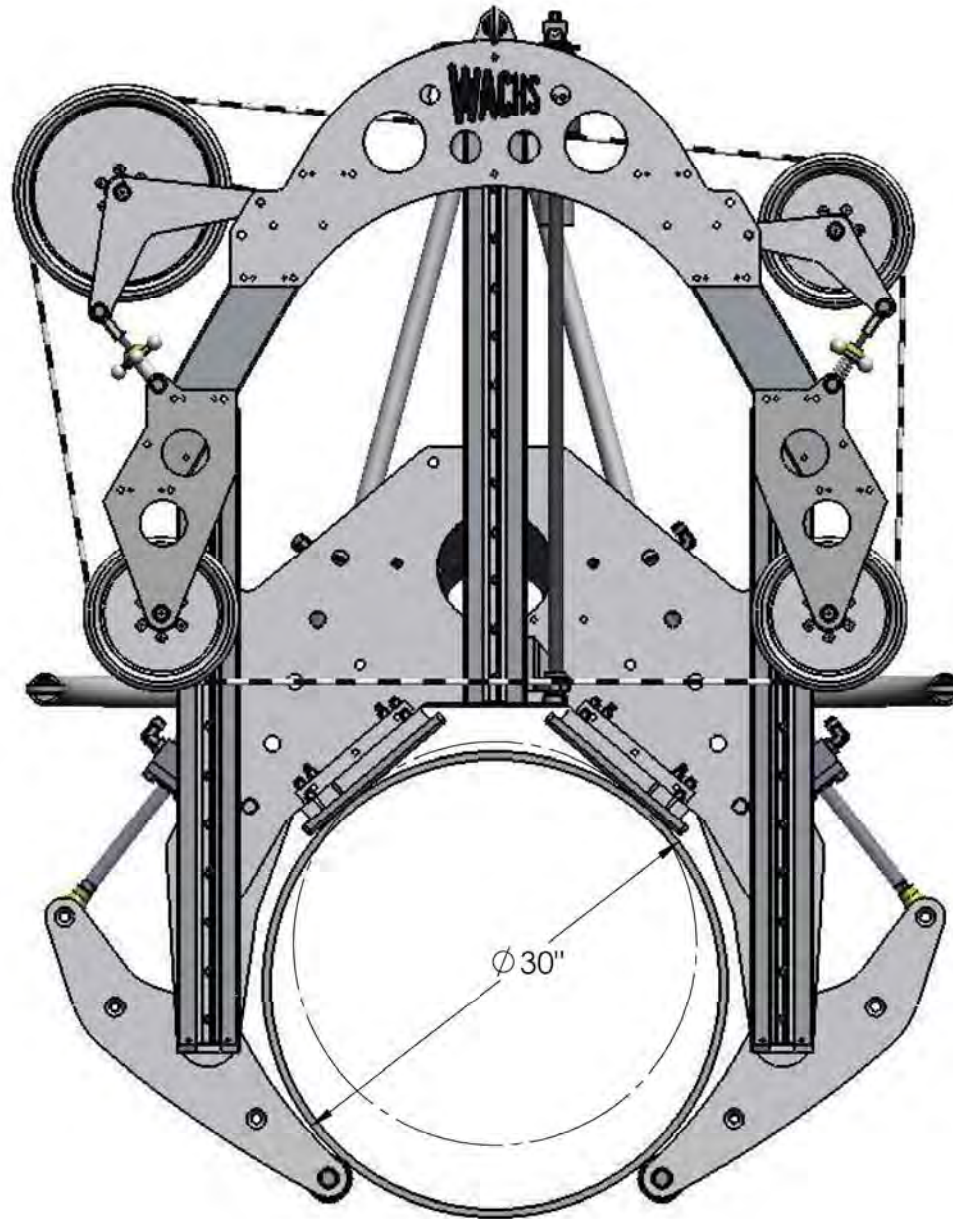
Storing the Machine

Store the machine sitting horizontal with the front of it (the side with the Wachs logo) facing up. For long-term storage, clean and dry the machine thoroughly, then cover it with a waterproof cover.

You can leave the wire installed on the machine during storage. Keep a normal amount of tension on the wire to hold it in place.

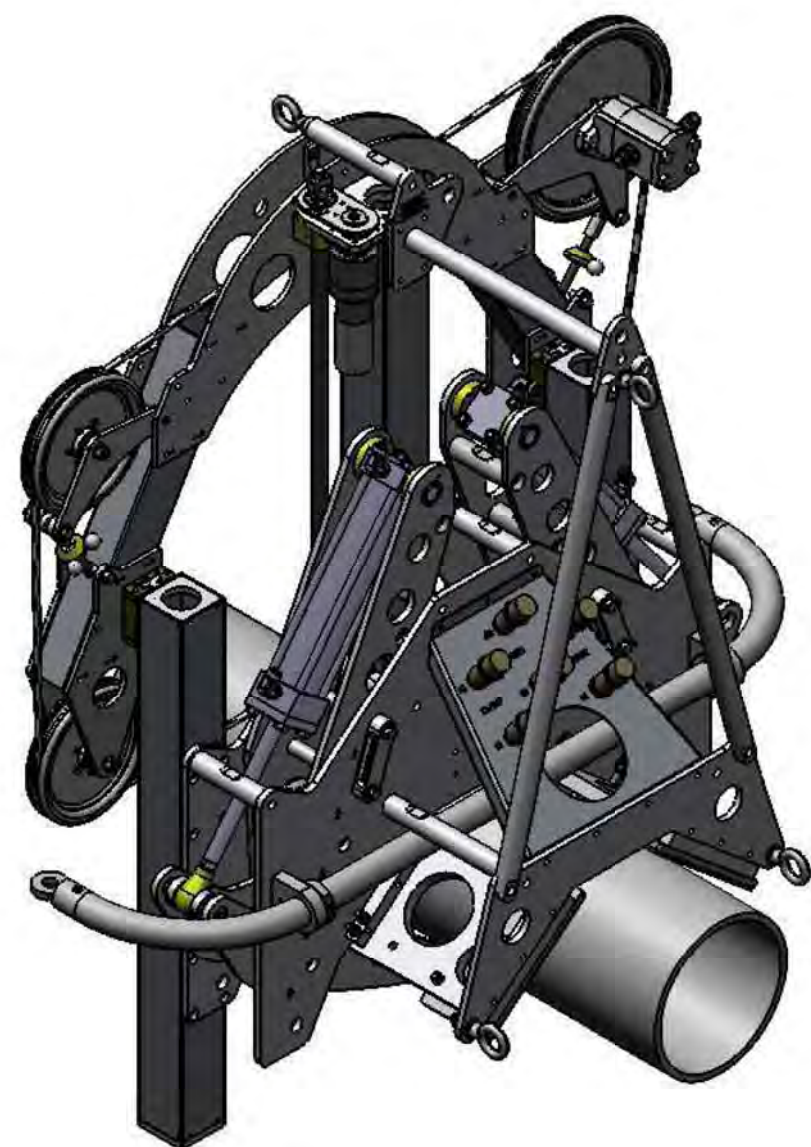


3012 Wire Saw
CLAMP POSITION # 1
(30"-26" AS SHOWN)

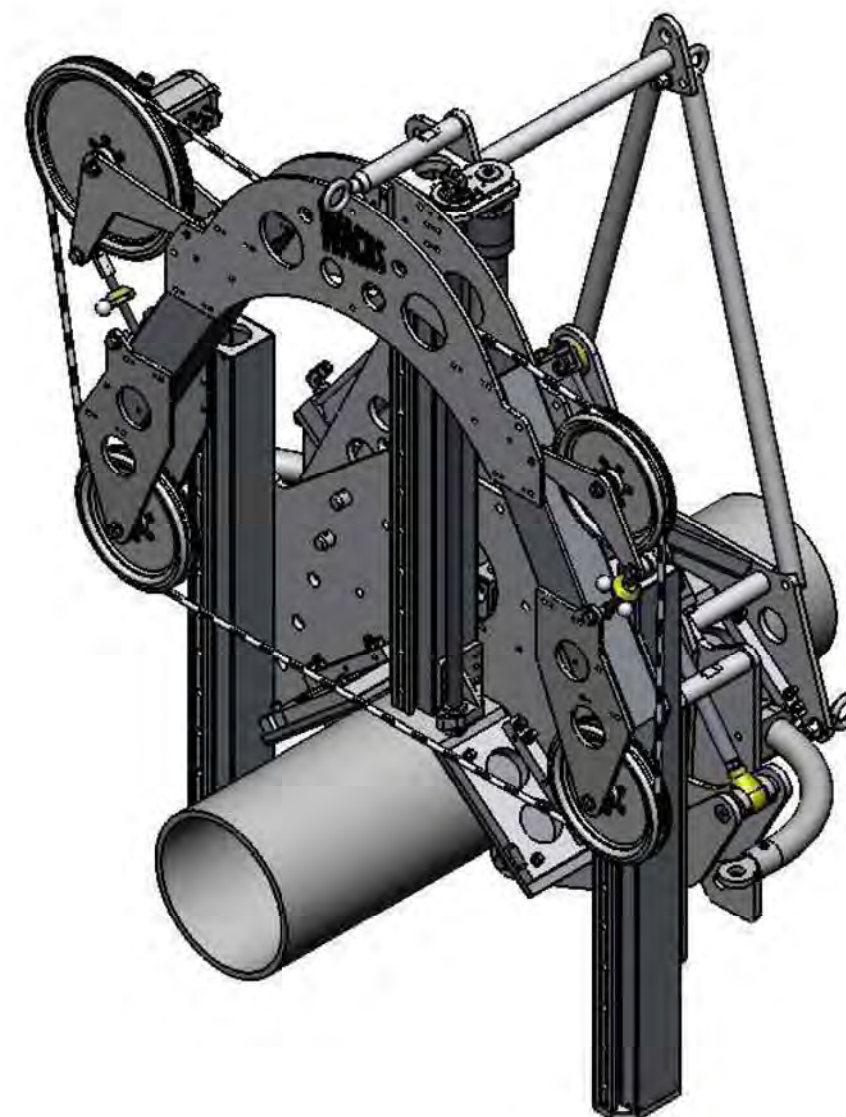
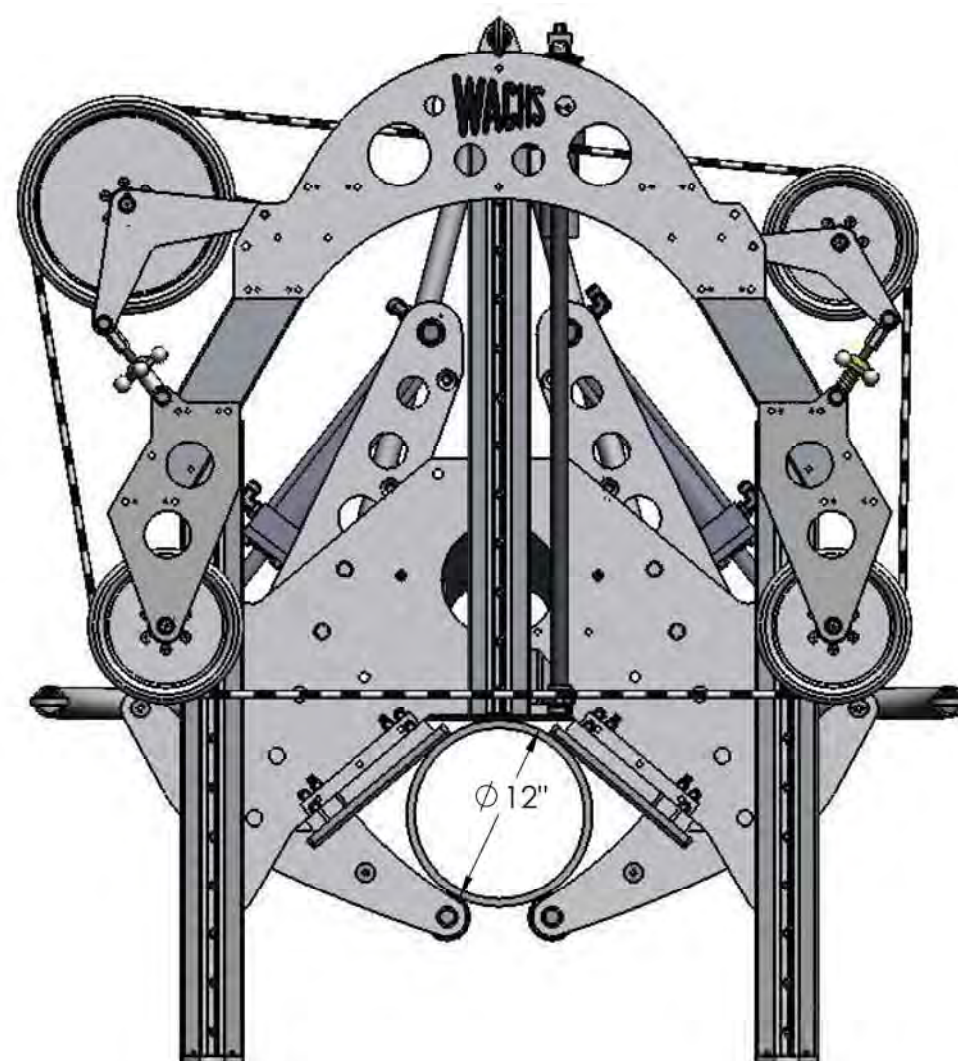


Clamp Arm Positions

Position	Pipe Dia. Range
1	30"-26"
2	26"-22"
3	22"-18"
4	18"-14"
5	14"-12"



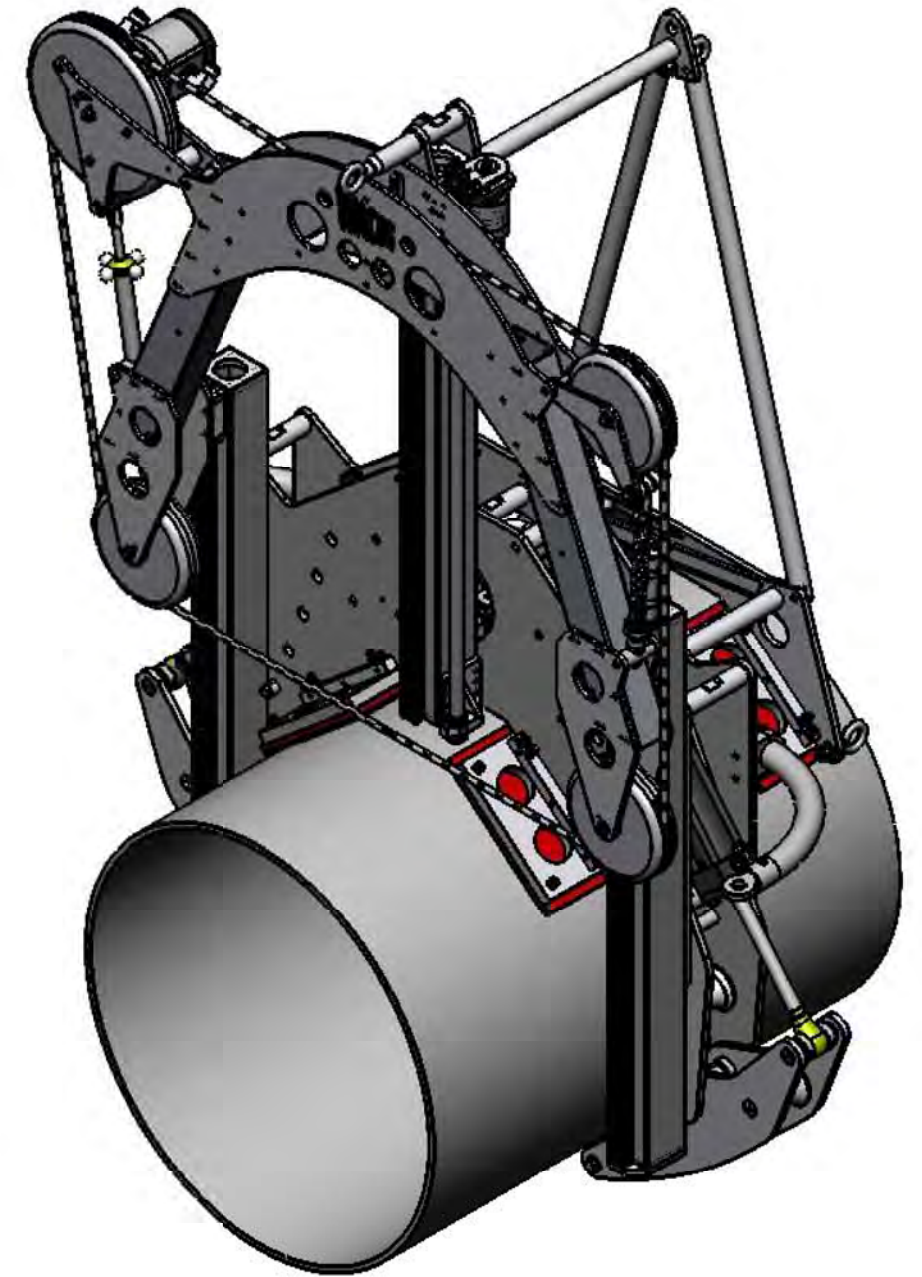
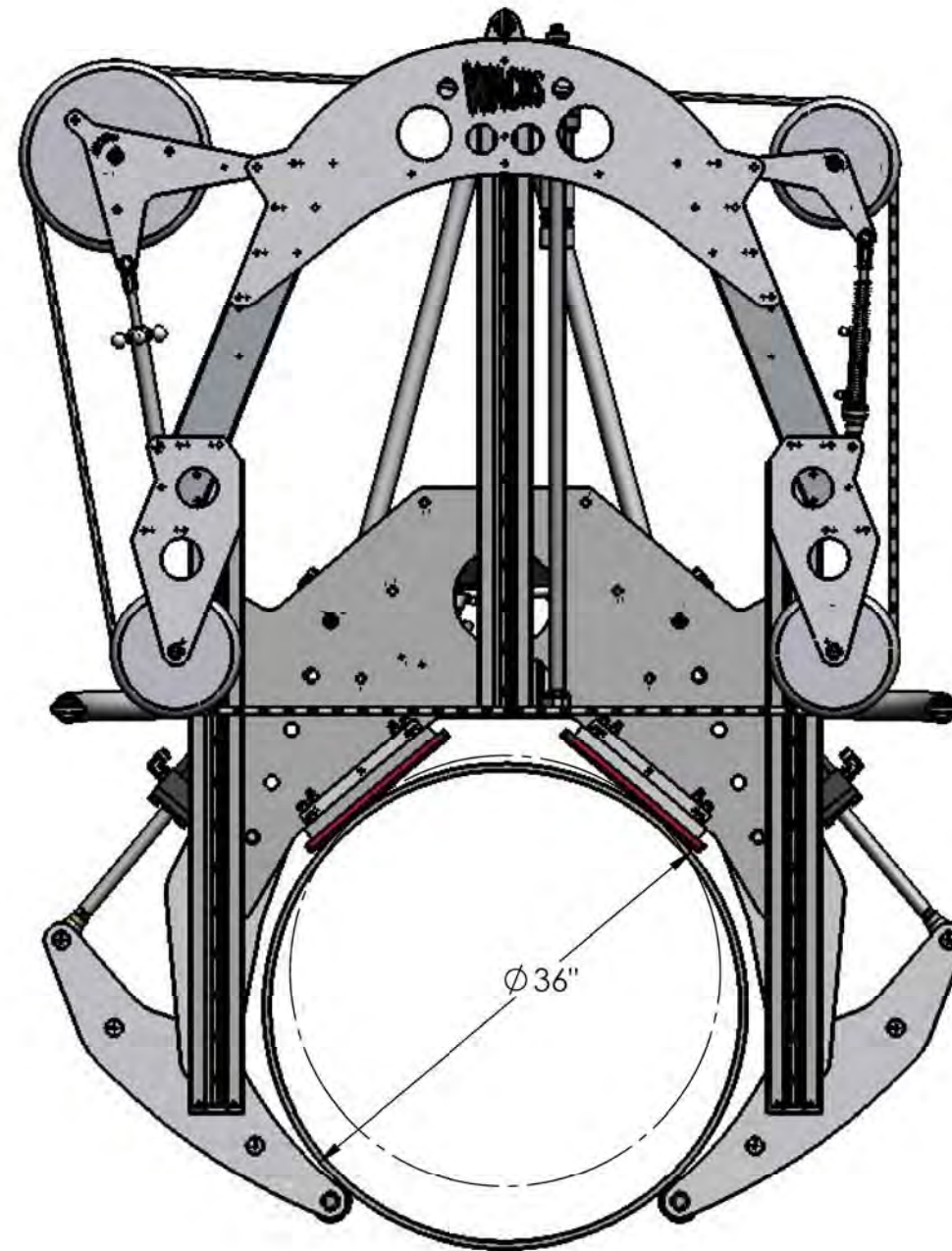
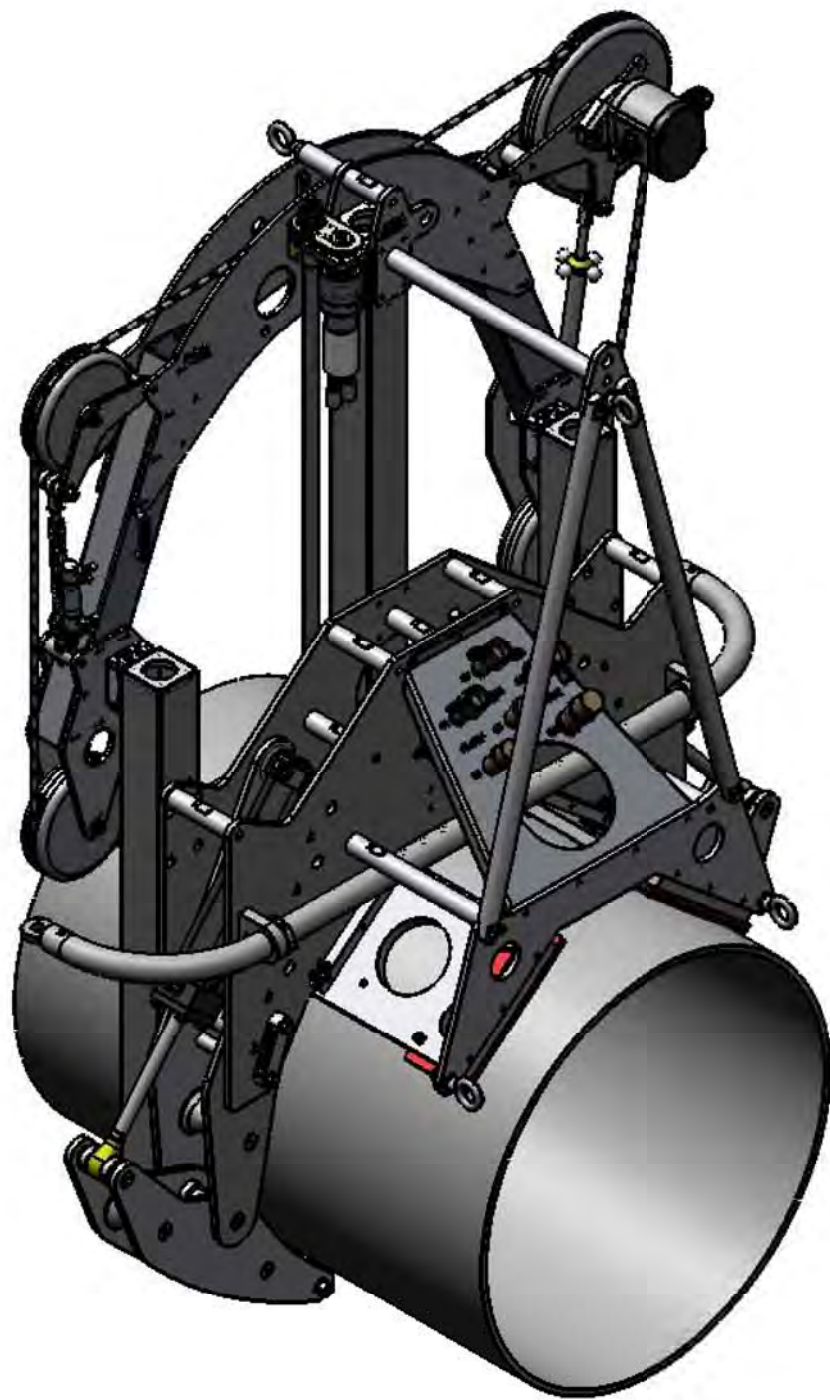
3012 Wire Saw
CLAMP POSITION # 5
(14"-12" AS SHOWN)



Clamp Arm Positions

Position	Pipe Dia. Range
1	30"-26"
2	26"-22"
3	22"-18"
4	18"-14"
5	14"-12"

3616 Wire Saw
CLAMP POSITION # 1
(36"- 32" AS SHOWN)

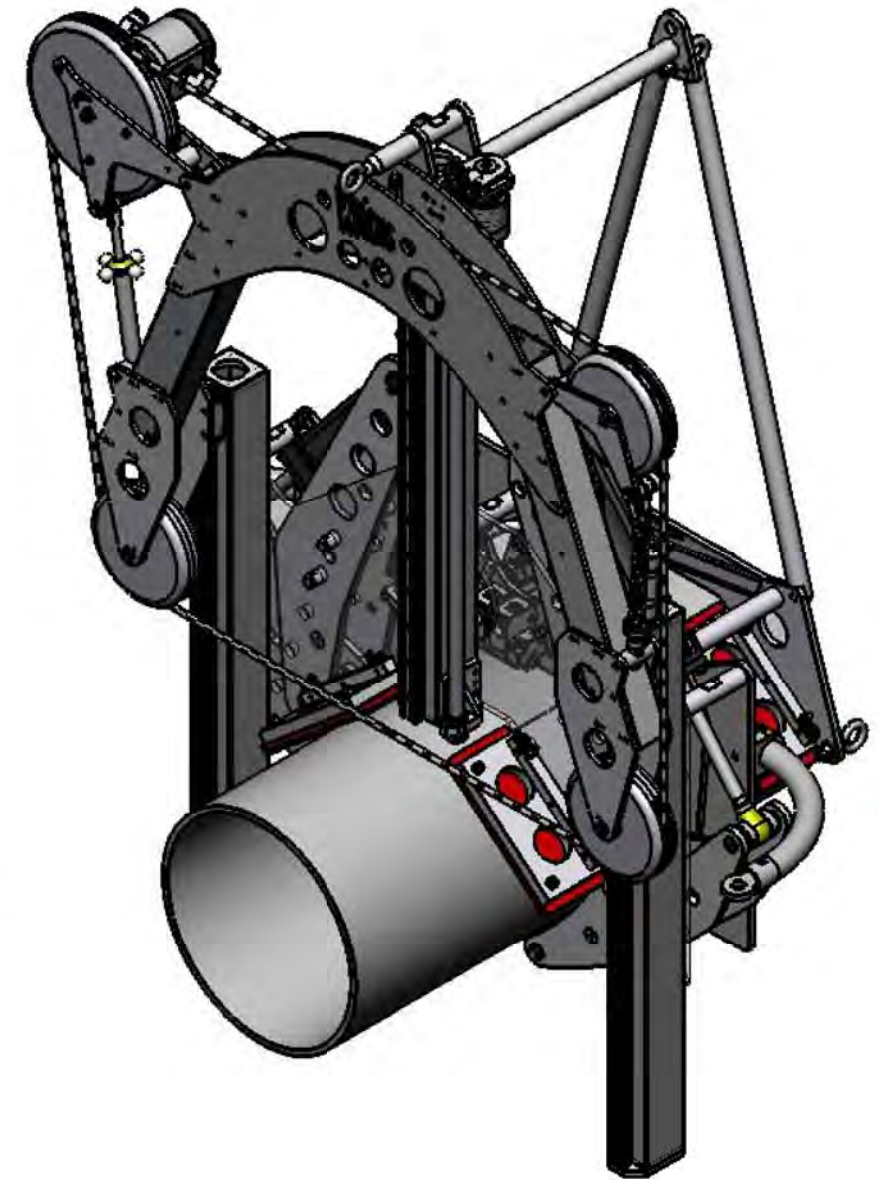
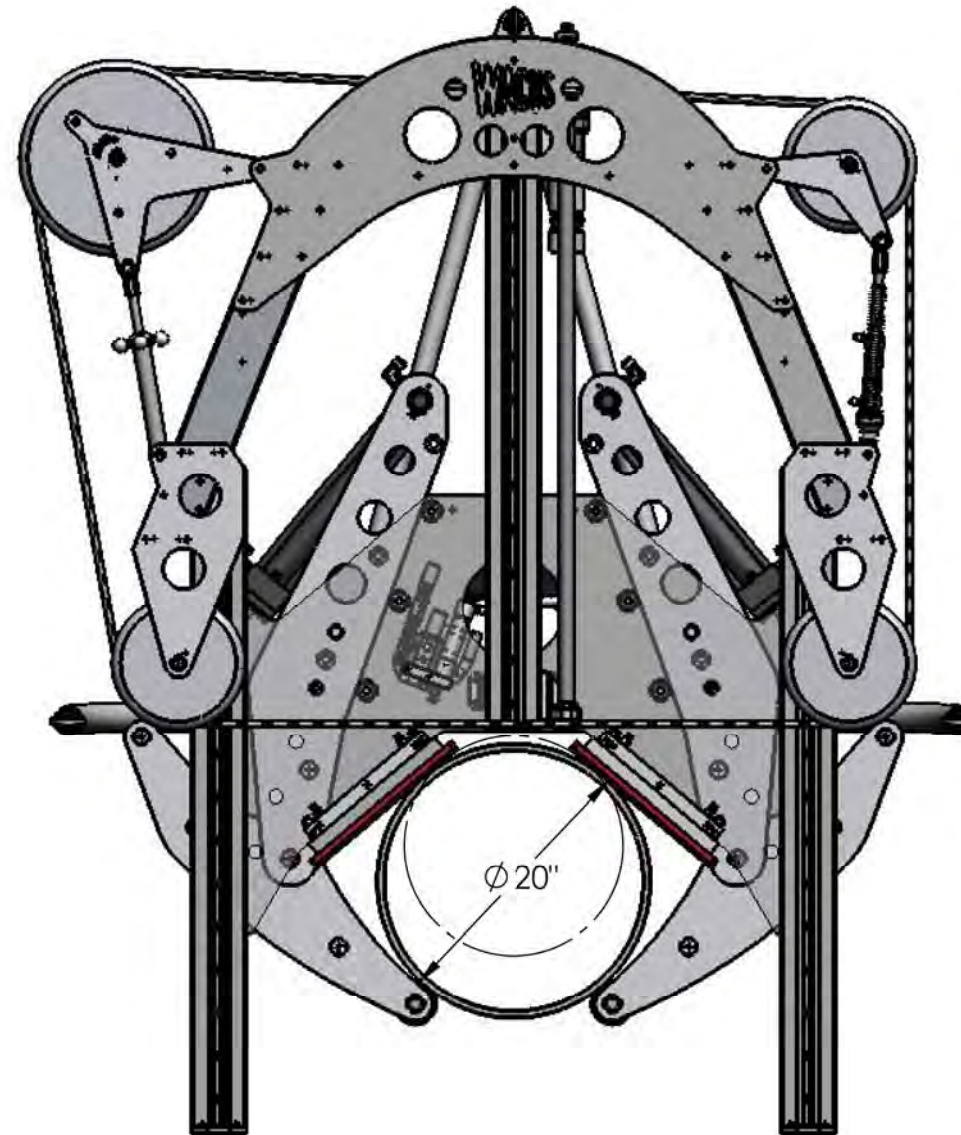


Clamp Arm Positions

Position	Pipe Dia. Range
1	36"-32"
2	32"-28"
3	28"-24"
4	24"-20"
5	20"-16"

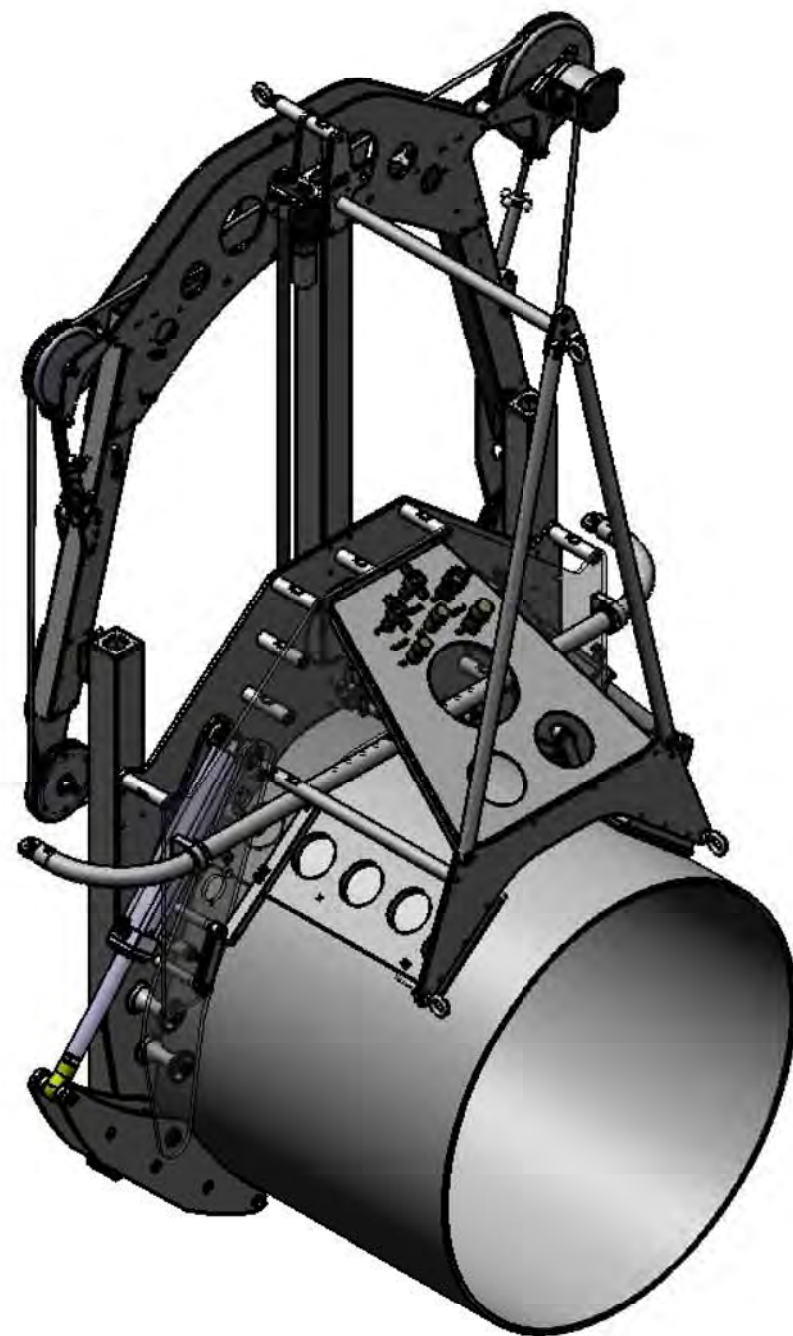


3616 Wire Saw
CLAMP POSITION # 5
(20" - 16" AS SHOWN)

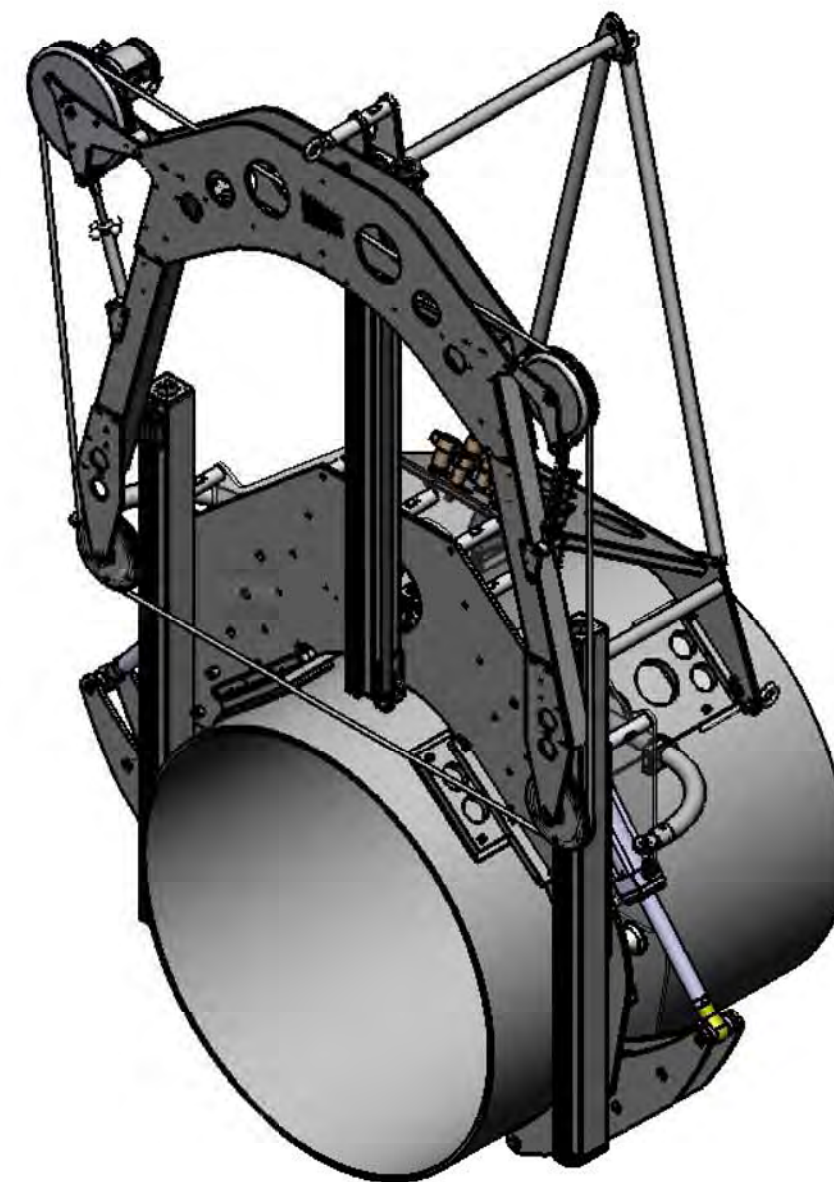
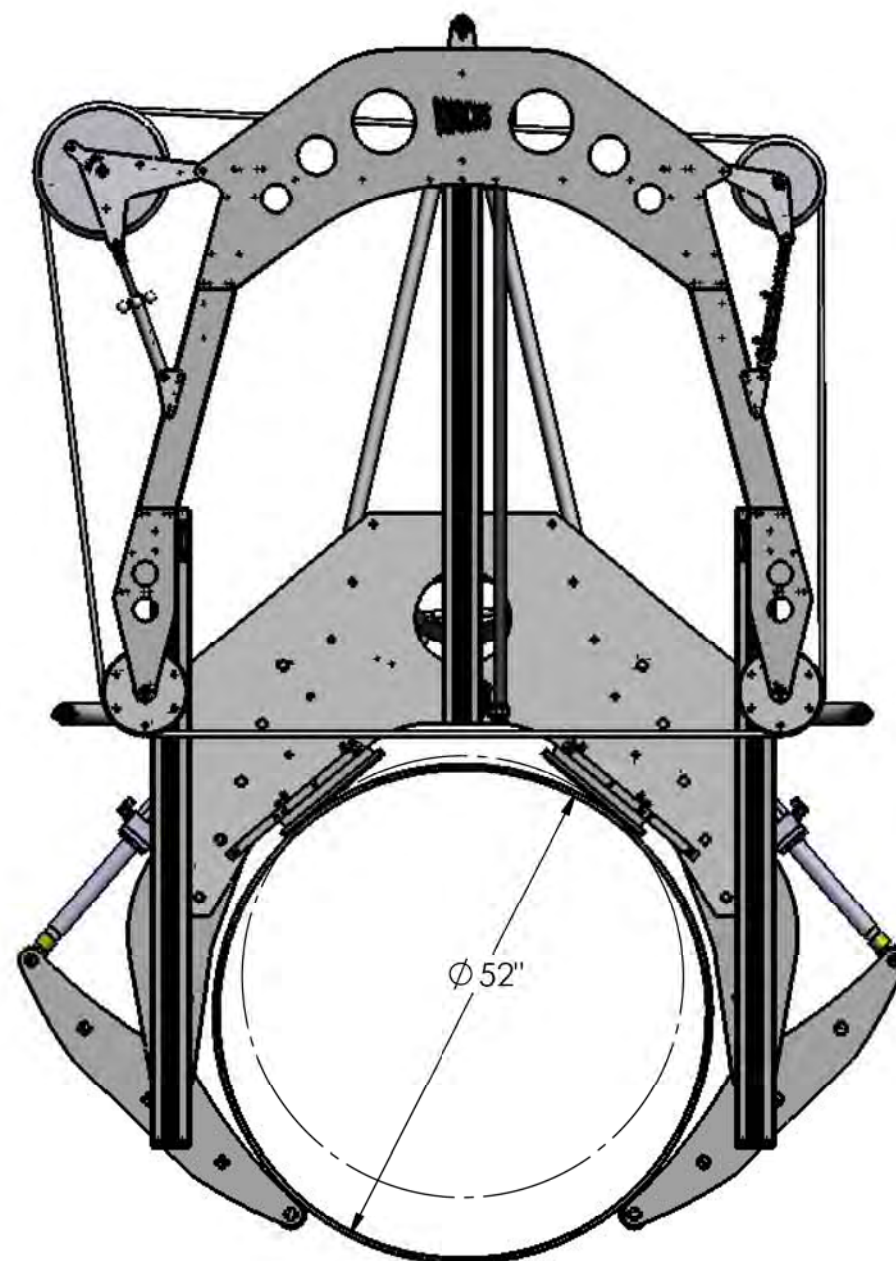


Clamp Arm Positions

Position	Pipe dia. Range
1	36"-32"
2	32"-28"
3	28"-24"
4	24"-20"
5	20"-16"

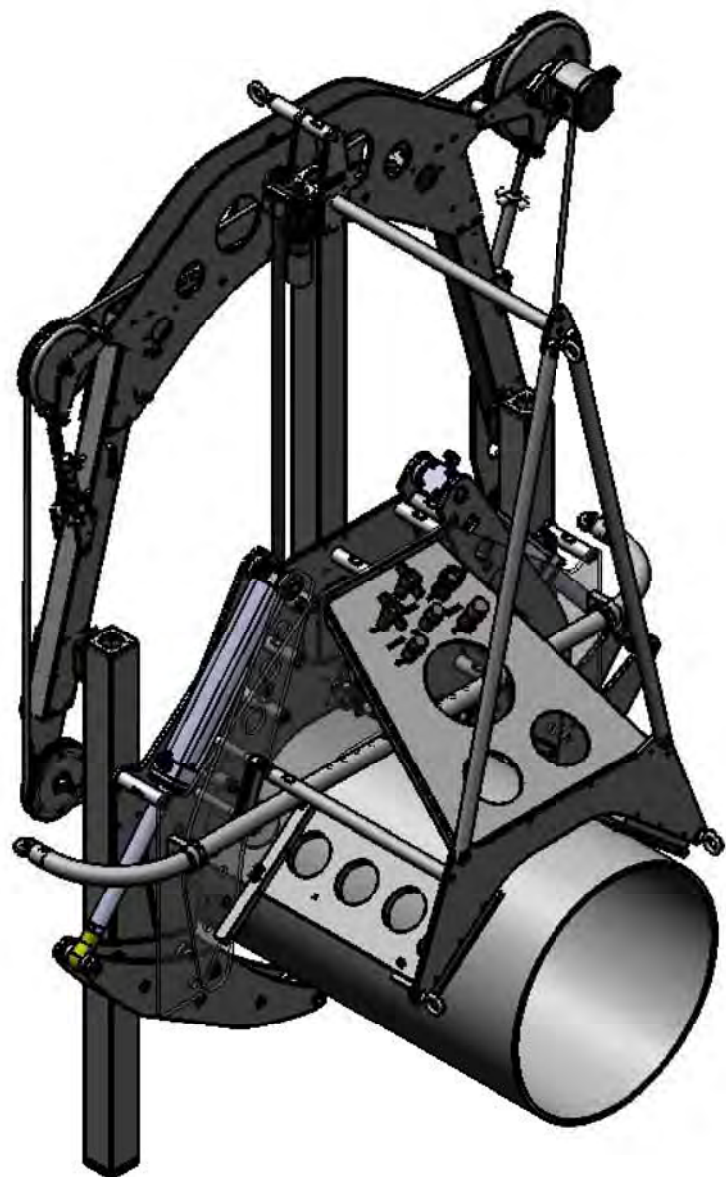


5230 Wire Saw
CLAMP CONFIGURATION # 1
(52"-46" AS SHOWN)

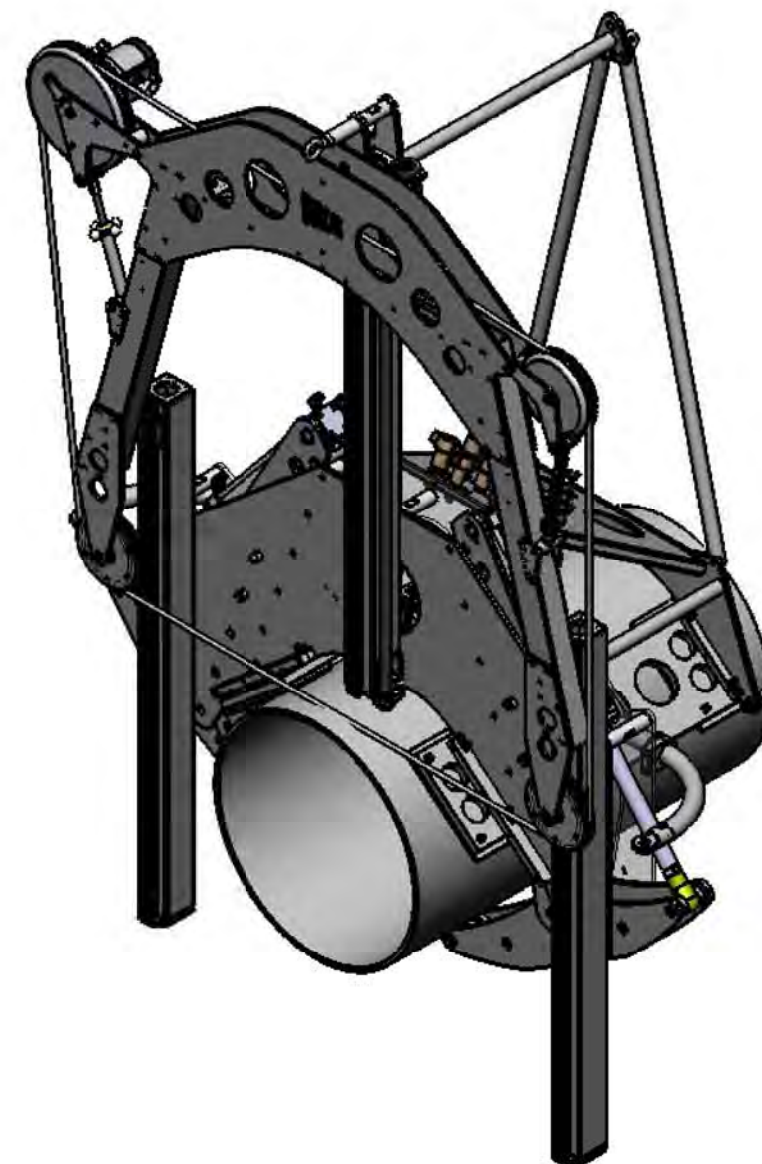
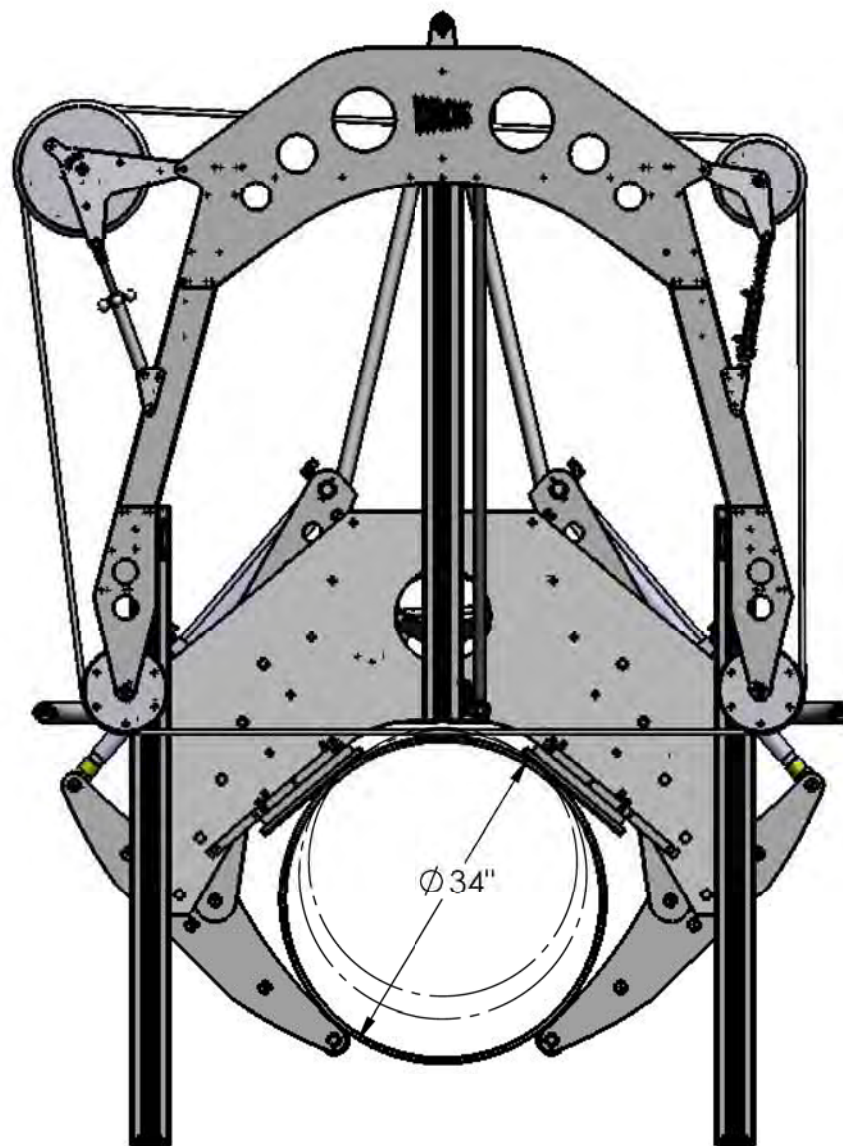


Clamp Arm Positions

Configuration	Pipe Dia. Range
1	52"-46"
2	46"-40"
3	40"-34"
4	34"-28"



5230 Wire Saw
CLAMP CONFIGURATION # 4
(34"-28" AS SHOWN)



Clamp Arm Positions

Configuration	Pipe Dia. Range
1	52"-46"
2	46"-40"
3	40"-34"
4	34"-28"

Chapter 2

Safety

The E.H. Wachs Company takes great pride in designing and manufacturing safe, high-quality products. We make user safety a top priority in the design of all our products.

Read this chapter carefully before operating the subsea wire saw. It contains important safety instructions and recommendations.

OPERATOR SAFETY

WARNING: The cutting wire spins at very high speed. If the wire breaks, segments of the wire can fragment and be thrown from the machine at dangerous speeds. When operating the machine topside, stay a safe distance from the machine, or behind a protective barrier. Divers should stay a safe distance from the machine when it is running. **Serious injury or death could result from contact with the wire or as a result of the wire breaking.**

Follow these guidelines for safe operation of the equipment.

- **READ THE OPERATING MANUAL.** Make sure you understand all setup and operating instructions before you begin.
- **INSPECT MACHINE AND ACCESSORIES.** Before starting the machine, look for loose bolts or nuts, leaking lubricant, rusted components, and any other physical conditions that may affect operation.

In This Chapter

OPERATOR SAFETY

SAFETY LABELS



Look for this symbol throughout the manual. It indicates a personal injury hazard.

Properly maintaining the machine can greatly decrease the chances for injury.

- **ALWAYS READ PLACARDS AND LABELS.** Make sure all placards, labels, and stickers are clearly legible and in good condition. You can purchase replacement labels from E.H. Wachs Company.
- **KEEP CLEAR OF MOVING PARTS.** Keep hands, arms, and fingers clear of all rotating or moving parts. Always turn machine off before doing any adjustments or service.
- **SECURE LOOSE CLOTHING AND JEWELRY.** Secure or remove loose-fitting clothing and jewelry, and securely bind long hair, to prevent them from getting caught in moving parts of the machine.
- **KEEP WORK AREA CLEAR.** Keep all clutter and nonessential materials out of the work area. Only people directly involved with the work being performed should have access to the area.

Safety Symbols



This icon is displayed with any safety alert that indicates a personal injury hazard.

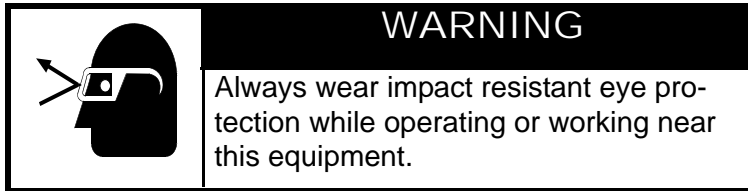
WARNING

This safety alert indicates a potentially hazardous situation that, if not avoided, **could** result in **death or serious injury**.

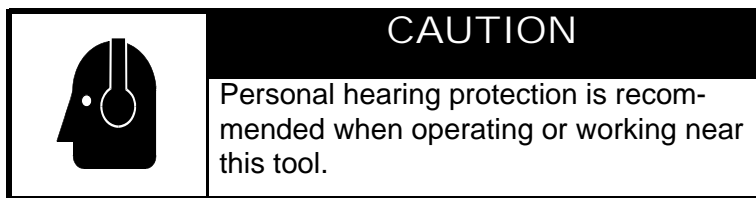
CAUTION

This safety alert, with the personal injury hazard symbol, indicates a potentially hazardous situation that, if not avoided, **could** result in **minor or moderate injury**.

Protective Equipment Requirements



For additional information on eye and face protection, refer to Federal OSHA regulations, 29 Code of Federal Regulations, Section 1910.133., Eye and Face Protection and American National Standards Institute, ANSI Z87.1, Occupational and Educational Eye and Face Protection. Z87.1 is available from the American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.



Hearing protectors are required in high noise areas, 85 dBA or greater. The operation of other tools and equipment in the area, reflective surfaces, process noises, and resonant structures can increase the noise level in the area. For additional information on hearing protection, refer to Federal OSHA regulations, 29 Code of Federal Regulations, Section 1910.95, Occupational Noise Exposure and ANSI S12.6 Hearing Protectors.

SAFETY LABELS

There is no safety labeling on the subsea wire saw.

Chapter 3

Operating Instructions

TENSIONING THE CUTTING WIRE

You should have the wire installed according to the maintenance instructions in Chapter 4.

1. At the tension wheel fixture, check the start lines on the feed control actuator. When there is no tension on the wire, the actuator rod will be retracted and the start lines will be offset.

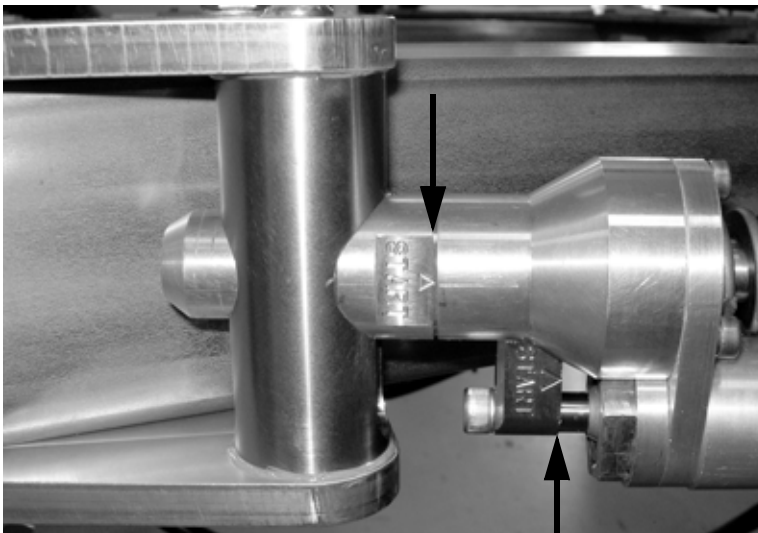


Figure 3-1. With no tension on the wire, the feed actuator start lines will be offset.

In This Chapter

TENSIONING THE CUTTING WIRE

SETTING THE CLAMP ARMS FOR THE PIPE SIZE

CONNECTING THE HYDRAULIC HOSES

MOUNTING THE MACHINE ON THE PIPE

PERFORMING THE CUT

REMOVING THE MACHINE

2. Tighten the drive wheel tensioning knob, as shown in Figure 3-2, until you can see the line on the spring-loaded driver wheel, Figure 3-3.

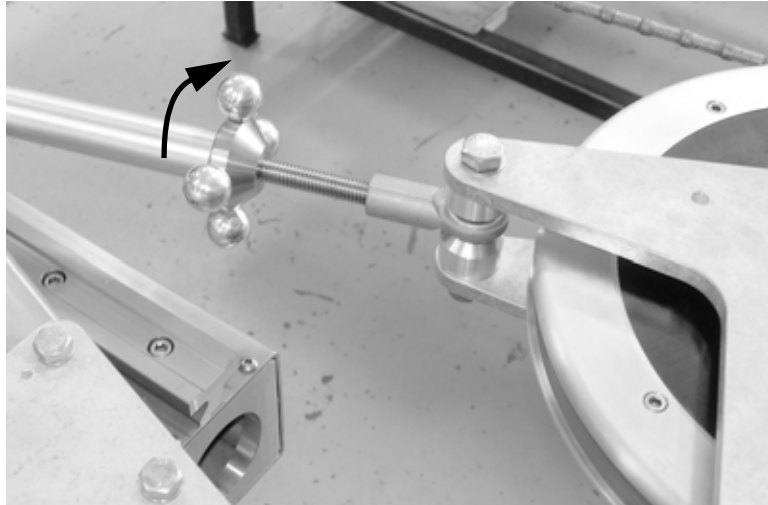


Figure 3-2. Turn the tension knob on the drive wheel fixture to increase the tension on the wire. (Depending on the exact length of the wire, about 3-4" of the screw will be visible when the tension is set correctly.)

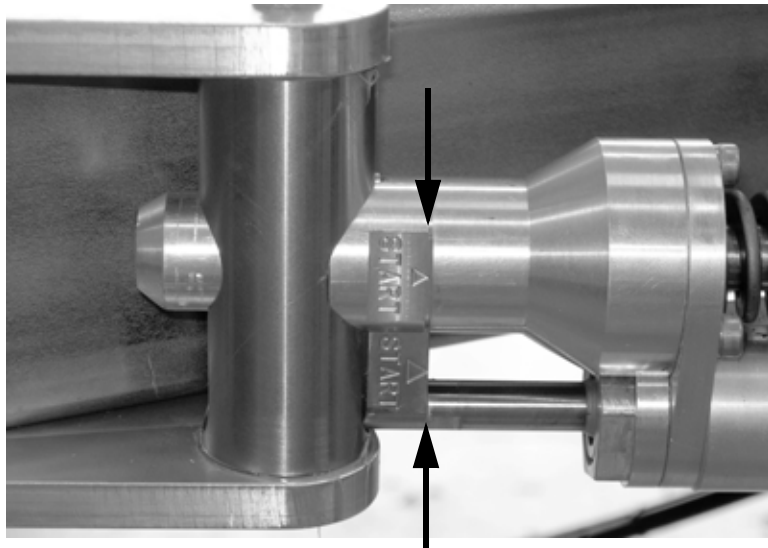


Figure 3-3. When the wire is properly tensioned, the start lines will be lined up together.

3. You should be able to deflect the wire fairly easily by pushing it up between the idler wheels. Push it in far enough to compress the tension spring, and make sure the actuator rod extends into the slot in the shaft.

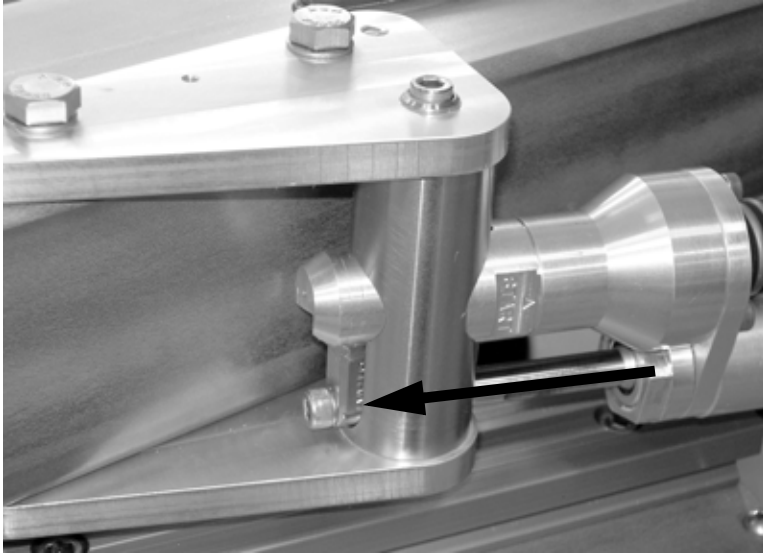


Figure 3-4. When you push the wire to deflect it, the actuator rod will extend.

SETTING THE CLAMP ARMS FOR THE PIPE SIZE

The clamp arms are attached to the main frame using forked pins that go through two holes in the frame. Multiple sets of holes allow the arms to be mounted in five positions.

The hole pairs for each position are stamped with the size of the largest pipe for that position. Refer to the following sections for the pipe size settings for each saw model.

WS-3012 Pipe Size Settings

Table 1 and Figure 3-5 describe the pipe size settings for the WS-3012 model.

Table 1: Pipe Size Ranges for Clamping Arm Positions—WS-3012

Size Stamp	Pipe Diameter Range
14	12" to 14" (305-356 mm)
18	14" to 18" (356-457 mm)
22	18" to 22" (457-559 mm)

**Table 1: Pipe Size Ranges for Clamping
Arm Positions—WS-3012**

Size Stamp	Pipe Diameter Range
26	22" to 26" (559-660 mm)
30	26" to 30" (660-762 mm)

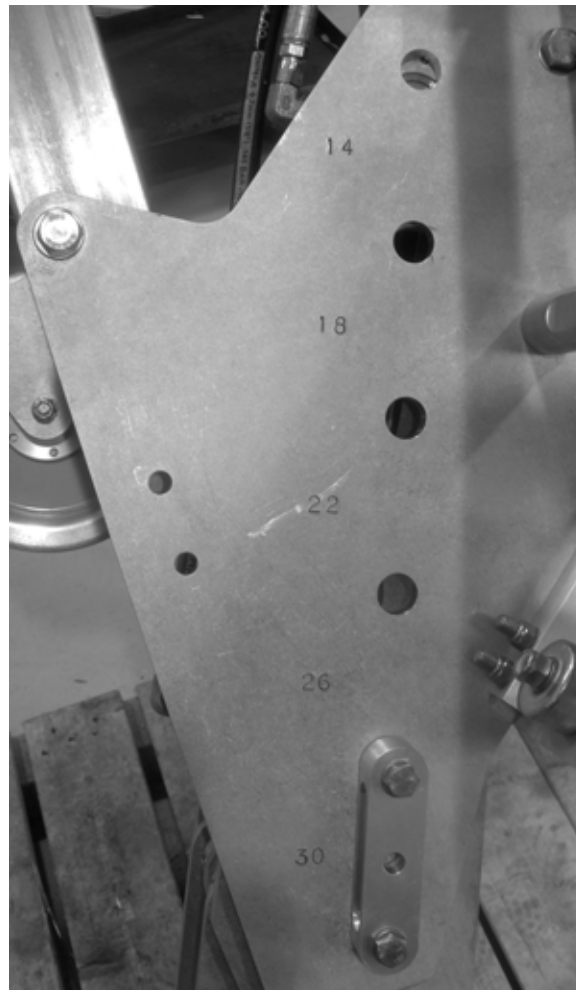


Figure 3-5. The photo shows the size stamps on the WS-3012 model. The pin is in the 26-30" position.

WS-3616 Pipe Size Settings

Table 2 and Figure 3-6 describe the pipe size settings for the WS-3616 model.

**Table 2: Pipe Size Ranges for Clamping
Arm Positions—WS-3616**

Size Stamp	Pipe Diameter Range
20	16" to 20" (406-508 mm)
24	20" to 24" (508-610 mm)
28	24" to 28" (610-711 mm)
32	28" to 32" (711-813 mm)
36	32" to 36" (813-914 mm)

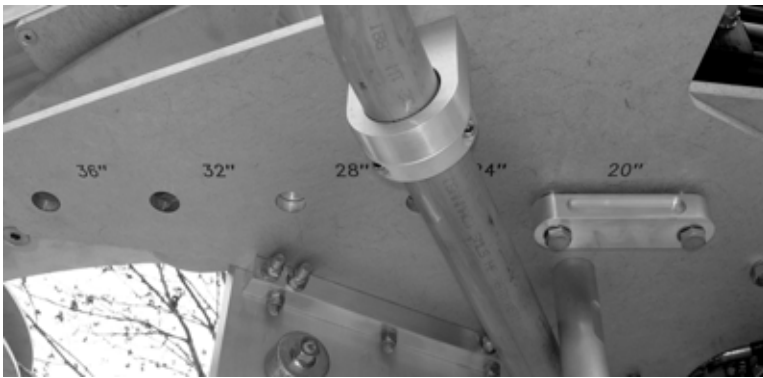


Figure 3-6. The photo shows the size stamps on the WS-3616 model. The pin is in the 16-20" position.

WS-5230 Pipe Size Settings

Table 3 and Figure 3-7 describe the pipe size settings for the WS-5230 model.

**Table 3: Pipe Size Ranges for Clamping
Arm Positions—WS-5230**

Size Stamp	Pipe Diameter Range
34	30" to 34" (762-864 mm)
40	34" to 40" (864-1016 mm)
46	40" to 46" (1016-1168 mm)
52	46" to 52" (1168-1321 mm)



WARNING

Do not attempt to change the clamp arm positions while the saw is in a vertical position. The clamp arms may fall when the pins are removed, resulting in personal injury and equipment damage.

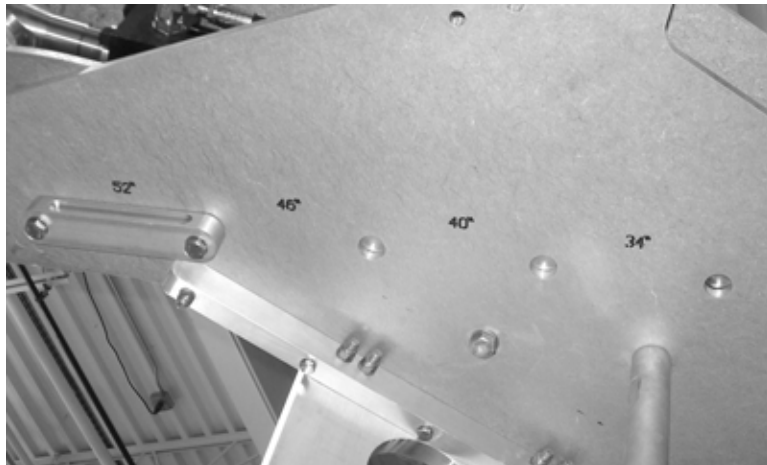


Figure 3-7. The photo shows the size stamps on the WS-5230 model. The pin is in the 46-52" position.

Positioning the Clamp Arms

Make sure the saw is sitting horizontally on a level surface before you adjust the clamp arms.

1. Remove the spring clips from both pin ends of the forked pin, then pull the forked pin out of the frame.



Figure 3-8. Remove the spring clips from both ends of the forked pin, then pull the pin out from the other side.

2. Slide the clamp arm assembly so that the mounting holes line up with the appropriate hole pair for the pipe size you are cutting.

3. Insert the forked pin through the back of the machine.



Figure 3-9. Insert the forked pin through the hole pair for the pipe size range (in this case, 46-52") you are cutting.

4. Insert the spring clips in the forked pin on the front of the machine.
5. Set the position of the other clamp arm to the same location.

CONNECTING THE HYDRAULIC HOSES

Connect the hydraulic hoses from the topside control panel (TCP) to the hydraulic bulkhead on the machine, as indicated in Figure 3-10.



CAUTION

Make sure both clamping arms are set at the same position. If they are not the same, the machine may not clamp securely on the pipe. Damage to the machine could result.



WARNING

The cutting wire spins at very high speed. If the wire breaks, segments of the wire can fragment and be thrown from the machine at dangerous speeds. Stay a safe distance from the machine, or behind a protective barrier, when operating it topside.

Serious injury or death could result from contact with the wire or as a result of the wire breaking.

Before lowering the machine subsea, test all three drive circuits to make sure they are working.

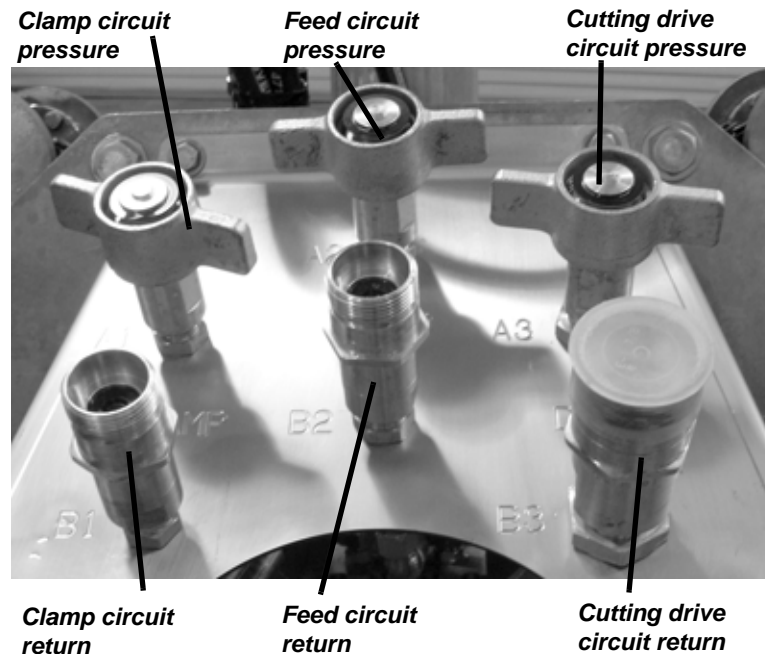


Figure 3-10. Attach the hydraulic hoses as shown. The ports marked “A” are pressure lines from the TCP; the ports marked “B” are return lines to the TCP.



CAUTION

Lift the machine **ONLY** on the lifting eyes provided. Lifting on any other component could damage the machine.

MOUNTING THE MACHINE ON THE PIPE

See “Rigging the Machine” in Chapter 1 for instructions on lifting the machine to position it for horizontal or vertical cuts.

- Attach lifting shackles to the appropriate lift eyes for the orientation of the machine.
- Before lowering the machine subsea to the cutting location, make sure the clamping arms are fully open.

Set the controls on the TCP as follows:

- All flow levers up (flow off).
- Cutter speed knob to 17.5 gpm
- Feed speed knob to 1.5 gpm
- (Clamp flow is preset to 4 gpm)
- Clamp direction to ENGAGE
- Feed direction to FORWARD
- (Cutter direction is preset to forward).



NOTE

The flow on the clamp circuit is set internally at 4 gpm.

1. Align the machine at the desired cut line, perpendicular to the center axis of the pipe. The clamping arms should extend around the pipe and the mounting shoes should be against the pipe, or close to it.
2. Start the hydraulic power unit. Set it to provide 22 gpm flow at 3000 psi.
3. Push both clamping flow levers down simultaneously. Watch the clamping pressure gauges to ensure that the pressure is within 1900-2200 psi.
4. When the clamping arms are fully clamped and the pressure is within 1900-2200 psi, pull both clamping flow levers up to lock the holding pressure. The pressure will drop quickly to 1850 psi and then slowly to about 1600 psi.
5. Repeat the clamp sequence three times. The pressure should hold above 1700 psi.

**CAUTION**

As you operate the machine, check the clamping pressure frequently to make sure it stays above 1700 psi. If it gets too low, stop the machine and reclamp it to the pipe.

PERFORMING THE CUT

1. Push the feed flow lever down to open the feed circuit.

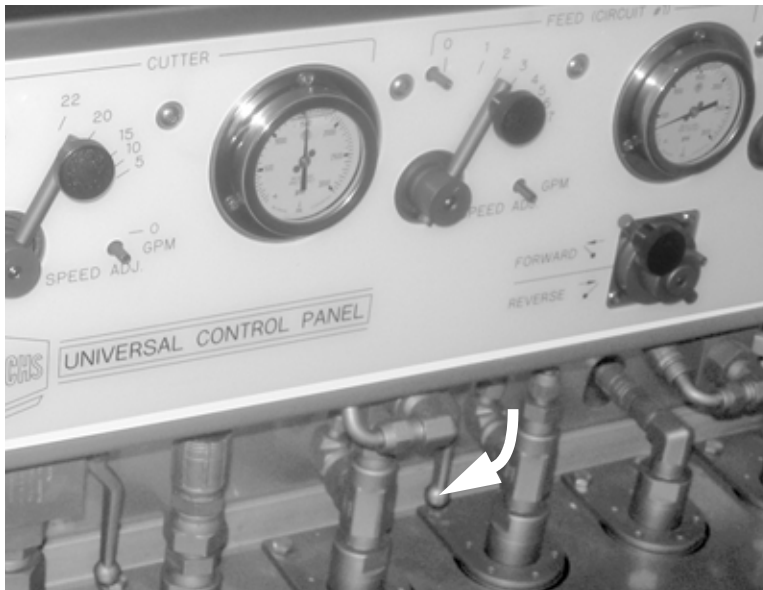


Figure 3-11. Push the feed flow lever down to supply power to the feed drive.

2. Set the feed speed knob to 2.5 gpm.

**WARNING**

The cutting wire spins at very high speed. If the wire breaks, segments of the wire can fragment and be thrown from the machine at dangerous speeds. Make sure all personnel are at a safe distance before starting the cutting drive. **Serious injury or death could result from contact with the wire or as a result of the wire breaking.**



NOTE

The larger the pipe size, the longer it will take to feed the cutting wire close to the pipe. This is because smaller pipes fit closer between the mounting shoes.



Figure 3-12. Push the feed speed knob down to 2.5 gpm.

3. Visually monitor the position of the cutting wire as the bow feeds toward the pipe. When the wire is within 1/4" of the pipe surface, pull the feed flow lever up to turn off the feed drive.
4. Push the cutting drive flow lever down to open the cutting drive circuit.



Figure 3-13. Push the cutting flow lever down to supply power to the cutting drive.

5. Start with the cutting speed knob at 18 gpm. Visually ensure that the wheels are spinning.



Figure 3-14. Push the cutting speed knob up to increase the drive wheel speed.

6. Push the feed flow lever down to start feeding the wire into the pipe. The feed speed knob should be at 2.5 gpm.
7. As the wire enters the cut, increase the cutting speed by moving the cutting speed knob. Do not go above 19 gpm.
8. During cutting, the feed control actuator on the tension wheel fixture adjusts the feed rate to keep the saw from overfeeding. It should not be necessary to adjust the feed rate at the TCP.
9. Continue until the wire has completely severed the pipe.
10. Pull the feed flow lever up to turn off the feed drive.



NOTE

At the minimum operating speed, the drive wheel will be spinning at about 1500 RPM.



NOTE

The feed drive will travel about 2 inches beyond the bottom of the largest pipe size.

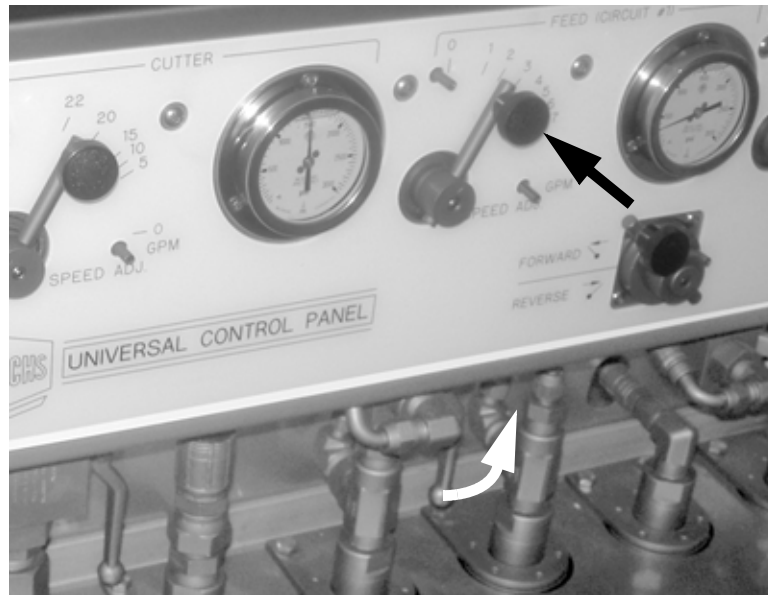


Figure 3-15. Push the feed flow lever up to 0 and pull the feed flow lever up to turn off the feed drive.

11. Pull the cutter flow lever up to turn off the cutter drive.

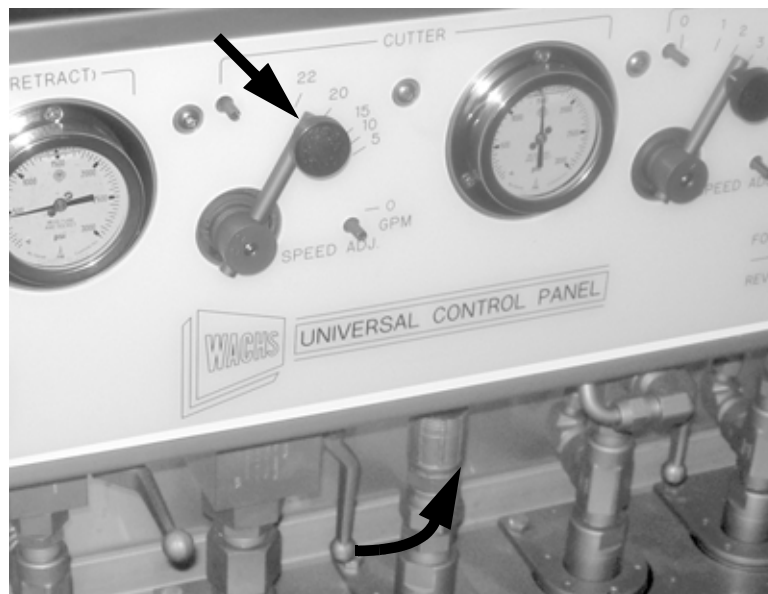


Figure 3-16. Pull the cutter flow lever up to turn off the cutter.

REMOVING THE MACHINE

1. Set the feed direction knob on the TCP to REVERSE.



Figure 3-17. Set the feed direction knob to REVERSE.

2. Push the feed flow lever down to open the feed circuit.

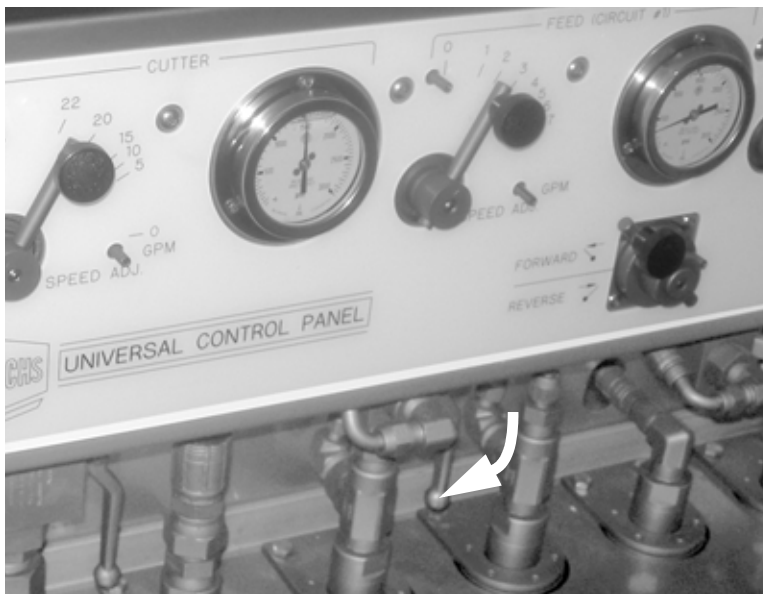


Figure 3-18. Push the feed flow lever down to supply power to the feed drive.

3. Push the feed speed knob down to 6.5 gpm (maximum flow).



Figure 3-19. Push the feed speed knob down to the maximum setting.



NOTE

It will take about 30 minutes to retract the feed drive on a 36 inch pipe.

4. When the saw bow is back at its home position, pull the feed flow lever up to stop the feed drive.



Figure 3-20. Pull the feed flow lever up to turn off the feed drive.

5. Rig the shackles to the overhead lift. Lift just enough to put tension on the chains and secure the machine.
6. Push the clamping direction knob to the RETRACT position.

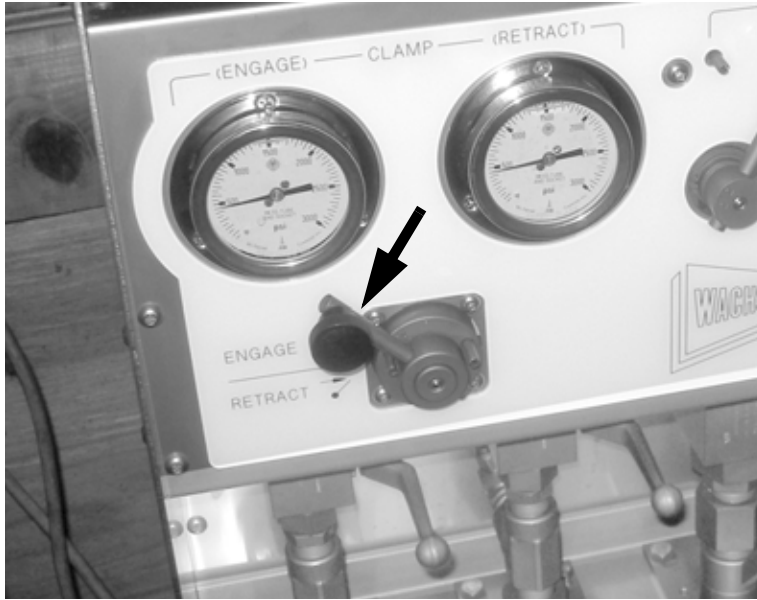


Figure 3-21. Set the clamping direction knob to RETRACT.

7. Push both clamping flow levers down simultaneously until the clamp arms are fully open. The right (return pressure) gauge reading will equal the system pressure. Pull the clamping flow levers back up.
8. Lift the machine off the pipe. Move it to the next cutting location or bring it topside if you are finished.



Chapter 4

Maintenance

LUBRICATION

Every time you use the machine, lubricate the following components.

1. Slowly pump multi-purpose No. 2 EP marine grease into the grease fittings on each of the 4 wheel hubs. (Do NOT use AquaLube on the wheel hubs.)

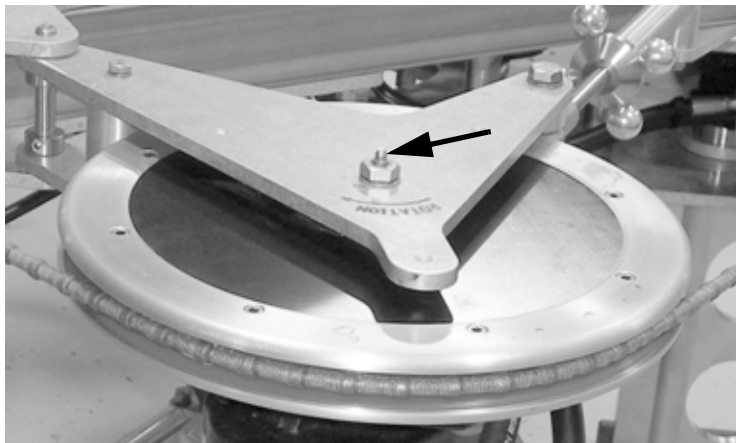


Figure 4-1. Each wheel hub has a grease fitting.

2. Pump AquaLube into the grease fittings on the feed gears, feed motor, and feed block (4 fittings).

In This Chapter

LUBRICATION

REPLACING THE CUTTING WIRE

REPLACING THE MOUNTING SHOES

REPLACING THE WHEEL LINERS



CAUTION

Do not directly apply lubricant to the feed screw.

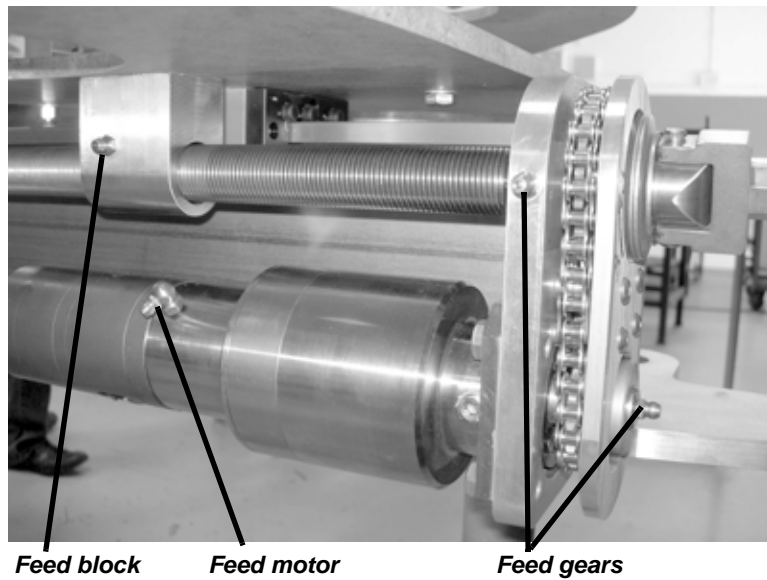


Figure 4-2. Grease the feed components shown at the top of the feed system.

3. Pump AquaLube into the grease fitting on the feed screw mount at the bottom of the screw.

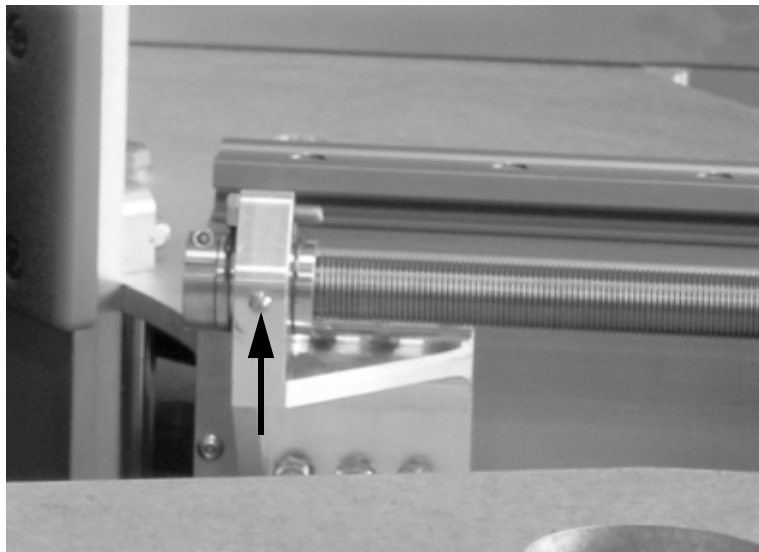


Figure 4-3. Grease the fitting at the bottom of the feed screw.

4. Pump AquaLube into the grease fittings on the cylinder rod ends until grease is visible.

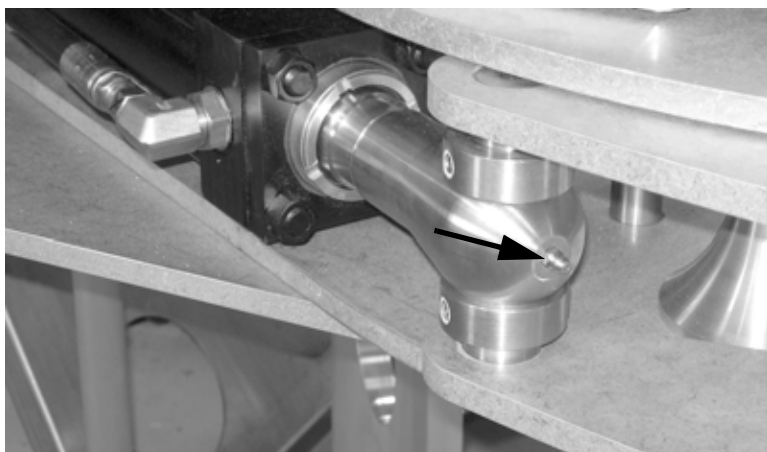


Figure 4-4. Both clamping cylinders have a grease fitting on the rod end.

REPLACING THE CUTTING WIRE

Start with the saw bow retracted all the way to the top of the frame.

1. Turn the tension knob on the drive wheel fixture all the way down to release the tension on the wire.

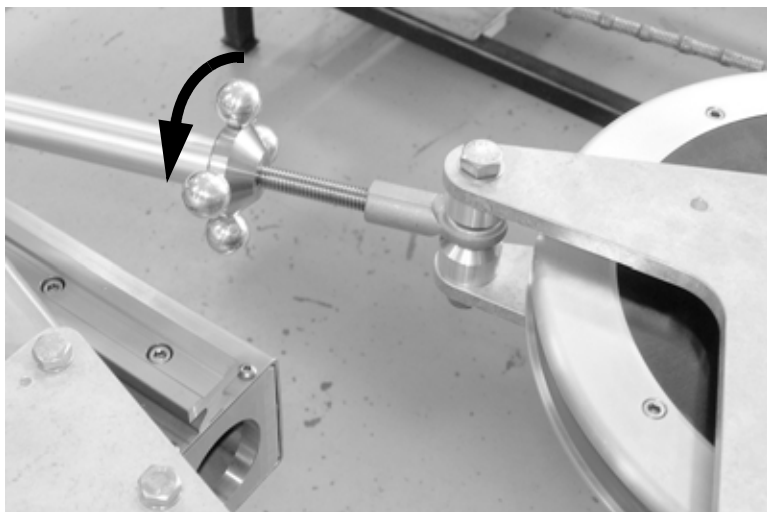


Figure 4-5. Turn the tensioning knob all the way down on the screw to loosen the wire.

2. Slip the wire off the drive wheel, then remove it from the other wheels.



CAUTION

Wear gloves when handling the wire. The abrasive surfaces are sharp and could cut your hands.

3. Different brands of wire have different markings to indicate cutting direction. Look at the new wire closely to determine direction.

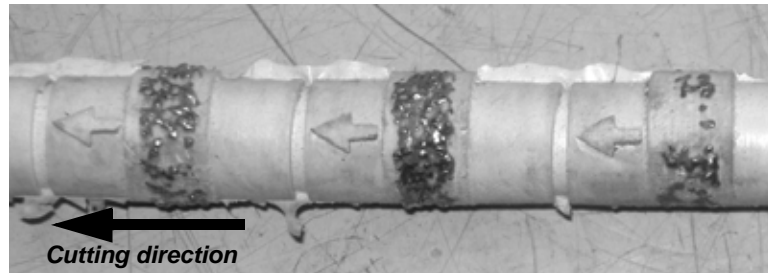


Figure 4-6. This wire has molded arrows indicating the cutting direction.

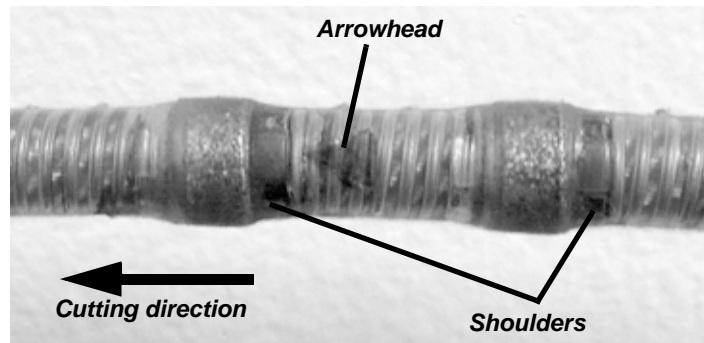
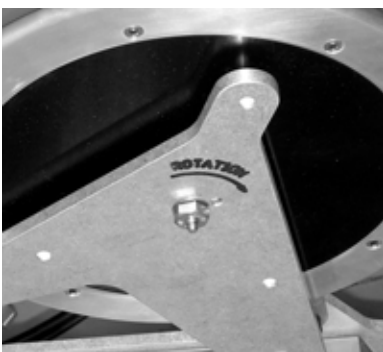


Figure 4-7. This type of wire has arrowheads molded into the plastic coating. The dark "shoulder" of the cutting bead should trail the bead as the wire cuts.



NOTE

The drive wheel fixture is stamped with an arrow showing the direction of rotation.



4. Place the new wire over the wheels, in reverse order of removing the wire. Be sure to mount it so that the arrows are in the direction of travel.

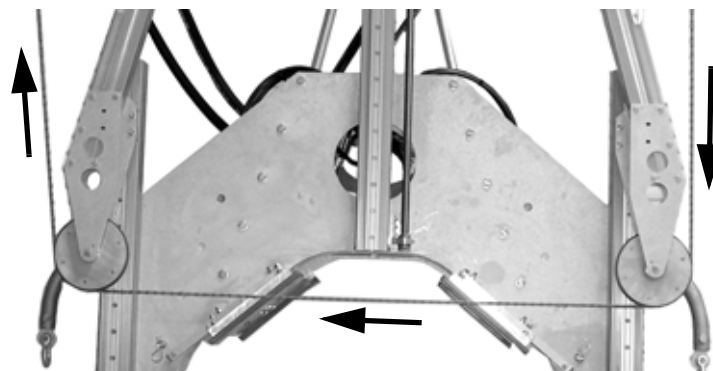


Figure 4-8. Install the wire so that the arrows point in the direction of travel, as shown.

5. Turn the drive wheel tension knob until the wire starts to tighten and stays on the wheels.
6. To prepare the machine for a new cut, set the wire tension as described in the operating instructions in Chapter 3.

REPLACING THE MOUNTING SHOES

You may have to replace the mounting shoes if they are damaged or worn. Four screws attach each shoe to the frame.

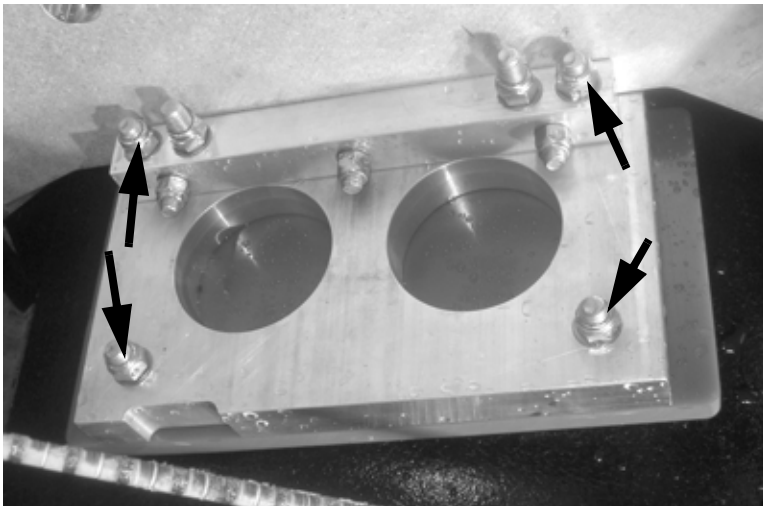


Figure 4-9. The four screws indicated hold the shoe to the machine frame.

1. Remove the nuts on the four screws holding the shoe in place.
2. Remove the shoe.
3. Put the new shoe in place and replace the screws.
4. Replace the nuts and tighten them securely.

REPLACING THE WHEEL LINERS

The liners on the cutting wire wheels are durable and long-lasting. They may wear out after extensive use, or be dam-

aged if the saw malfunctions. If necessary, replace them using the following procedure.

The tension wheel and 2 idler wheels are identical. The drive wheel is assembled differently than the others.

Tension and Idler Wheels

Remove the cutting wire before taking off any of the wheels.

1. Remove the nut on the end of the hub bolt and pull the bolt out of the wheel mounting fixture.

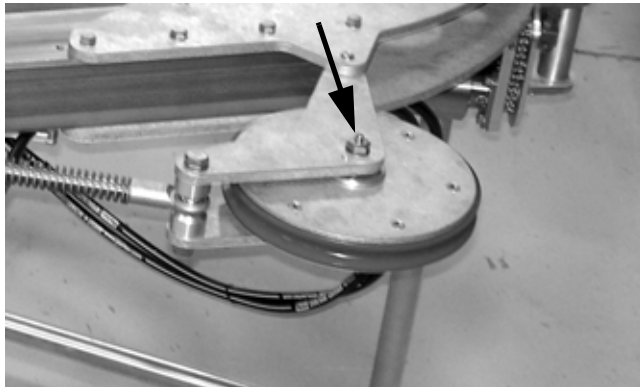


Figure 4-10. Remove the hub bolt to take off the wheel. The bolt head is on top in this view, with the nut on the bottom of the fixture.



NOTE

It may be easier to work on the wheel if you set it on something that supports the side plate, with a gap for the hub shaft to keep it from sitting on the shaft.

2. Remove the wheel from its mounting fixture and set it on a work surface. You can work on either side of the wheel.
3. Remove the 6 screws holding the side plate in place. You only need to remove one side plate.

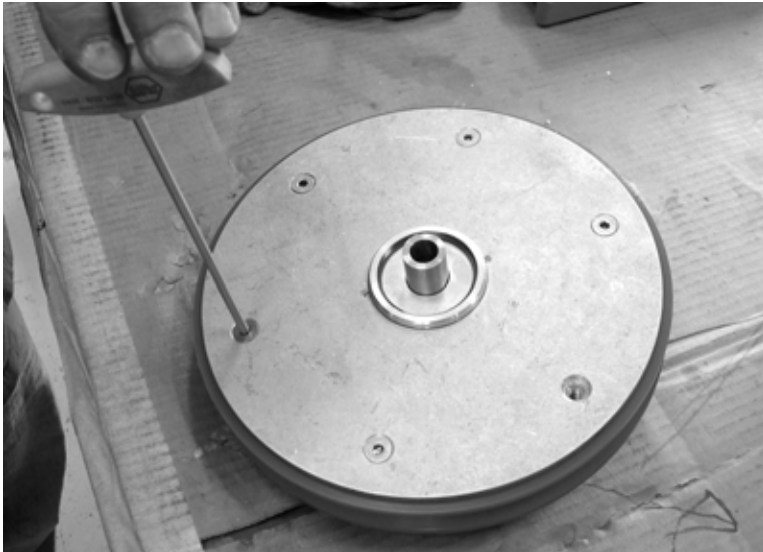


Figure 4-11. Remove the screws from the side plate to take it off.

4. Remove the side plate.
5. Remove the old wheel liner. You may have to pry it loose with a screwdriver.

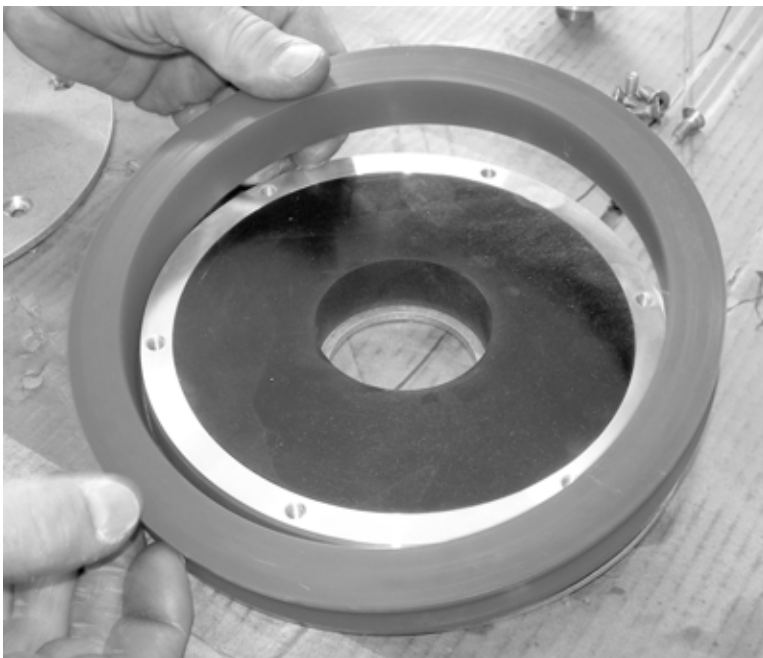


Figure 4-12. Pull the liner off the wheel. You may have to pry it with a screwdriver to get it loose.

6. Place the new liner on the wheel and press it down into place.

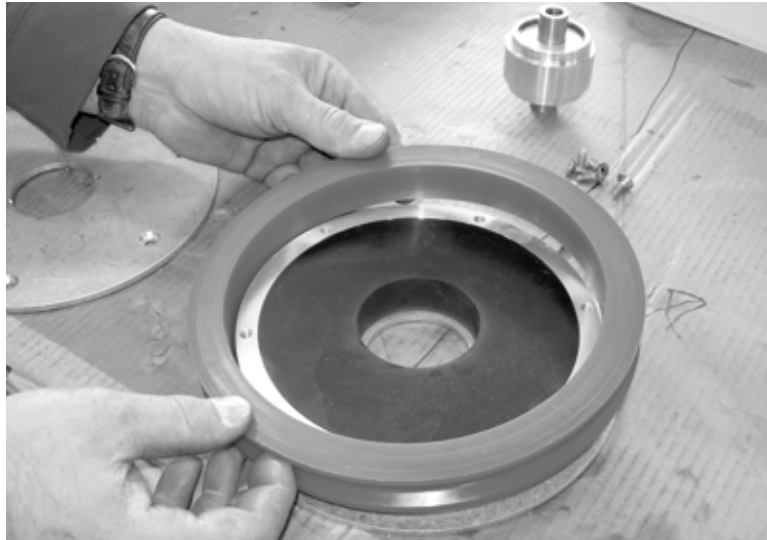


Figure 4-13. Put the new wheel liner on the wheel.

7. If you removed the shaft, replace it through the center of the wheel.

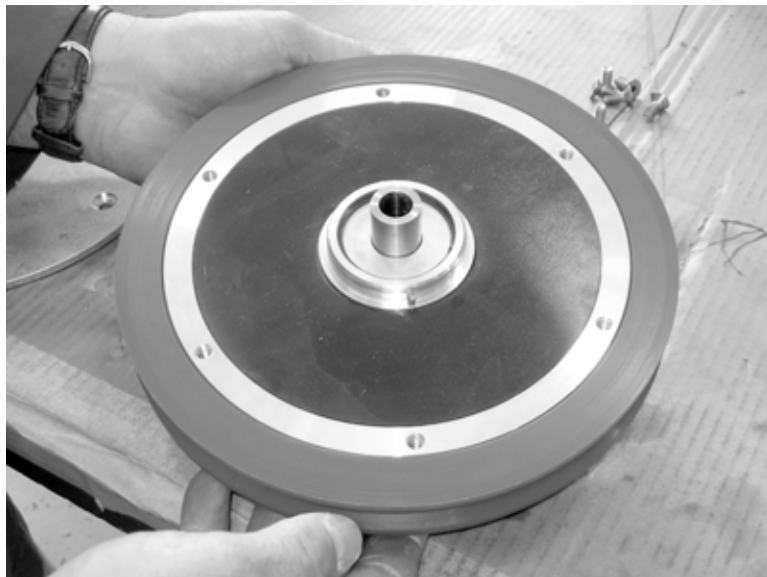


Figure 4-14. Replace the shaft through the center of the wheel.

8. Replace the side plate, making sure that the keys in the shaft fit into the slots in plate.

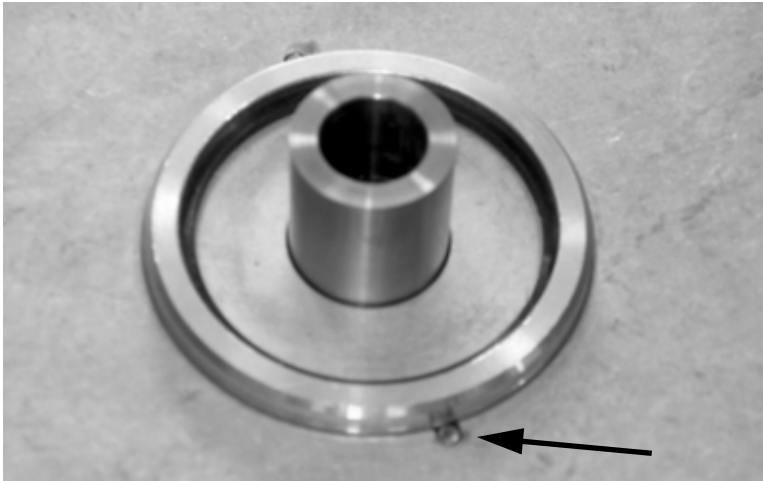


Figure 4-15. Make sure the shaft keys are in the slots on both side plates of the wheel.

9. Fasten the side plate with the 6 screws. Snug each screw, then tighten them in a criss-cross pattern to secure the wheel evenly.

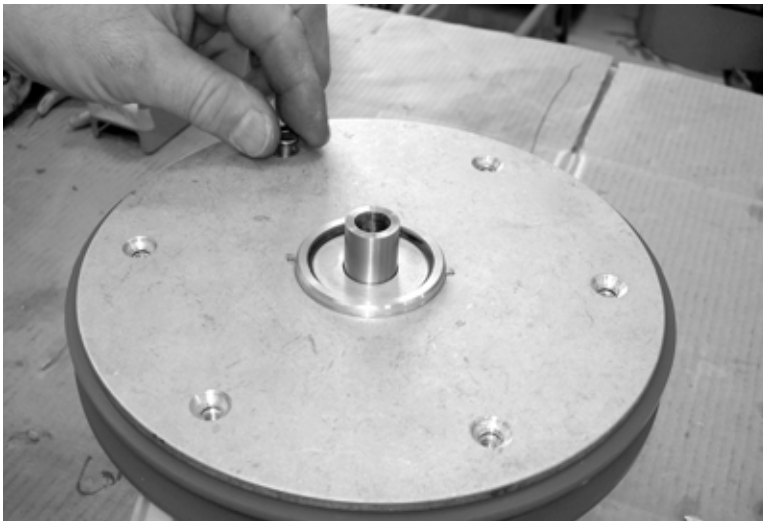


Figure 4-16. Replace the screws in the side plate.

10. Replace the wheel into its mounting fixture. Put the bolt through the top of the fixture, and install the nut on the bottom. Tighten the nut securely.

Drive Wheel

Remove the cutting wire before taking off any of the wheels.

To replace the drive wheel liner, you must first remove the wheel and motor assembly from the saw bow using the following procedure.

1. Hold or support the drive wheel and hydraulic motor assembly, so that it does not fall when you remove the fasteners holding it to the saw bow.
2. Loosen the set screws in the stop collars on the pivot pin and remove the pin from the frame. Be careful not to lose the stop collars.

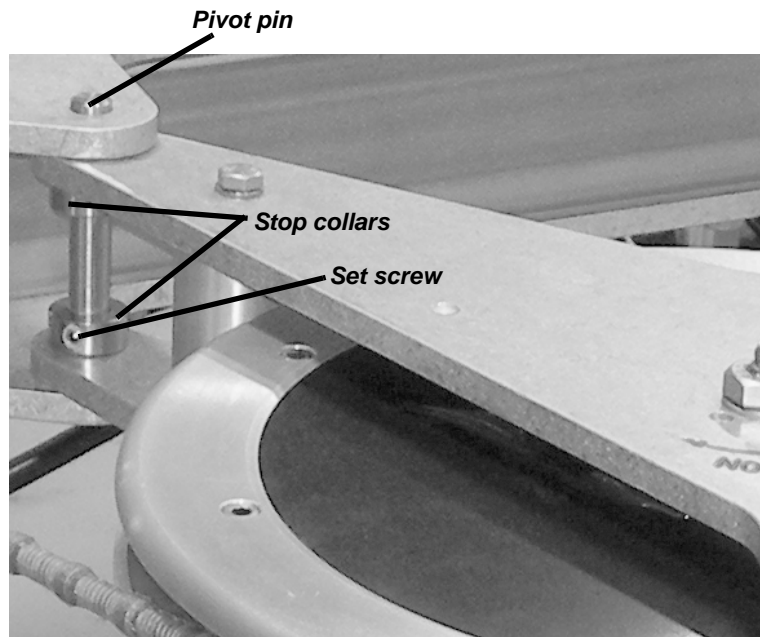


Figure 4-17. Loosen the set screws in the stop collars to remove the pivot pin.

3. Remove the nut from the bolt holding the wheel assembly to the tension rod, then remove the bolt. The wheel and motor assembly will be free from the saw bow.

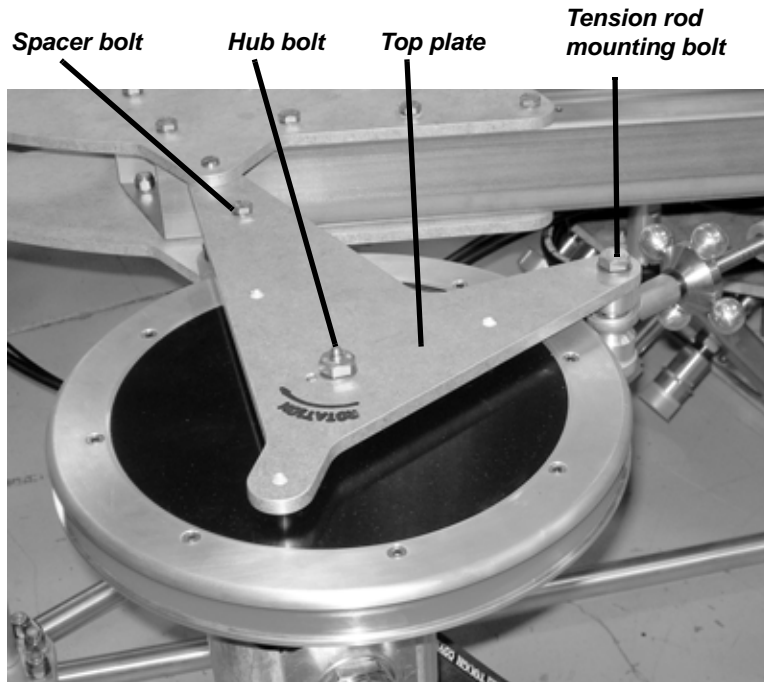


Figure 4-18. Remove the nut (on the bottom) of the tension rod mounting bolt, and remove the bolt.

4. Remove the hub bolt and spacer bolt from the wheel assembly, as shown in Figure 4-18. Be careful not to lose the spacer.
5. Pull the top plate off the wheel.
6. Pull the wheel up off the motor shaft. Note the side of the wheel that mounts onto the motor; the wheel is not reversible.
7. Disassemble the wheel and replace the liner as described in the previous section, "Tension and Idler Wheels".
8. Replace the wheel on the motor shaft, making sure the correct side is toward the motor.
9. Replace the top plate. Insert the spacer bolt through the spacer and snug it down.
10. Replace the hub bolt and snug it.
11. Replace the tension rod mounting bolt through the plates and tension rod end. Put the nut on the end of the bolt and tighten it securely.
12. Tighten the spacer bolt and hub bolt securely.

13. Slide the wheel and motor assembly plates into place in the saw bow and line up the pivot pin holes.
14. Set the stop collars in place between the plates. Insert the pivot pin through the top plate, the stop collars, and the bottom plate.
15. Holding the pivot pin in place, position the stop collars against the mounting plates and tighten the set screws.

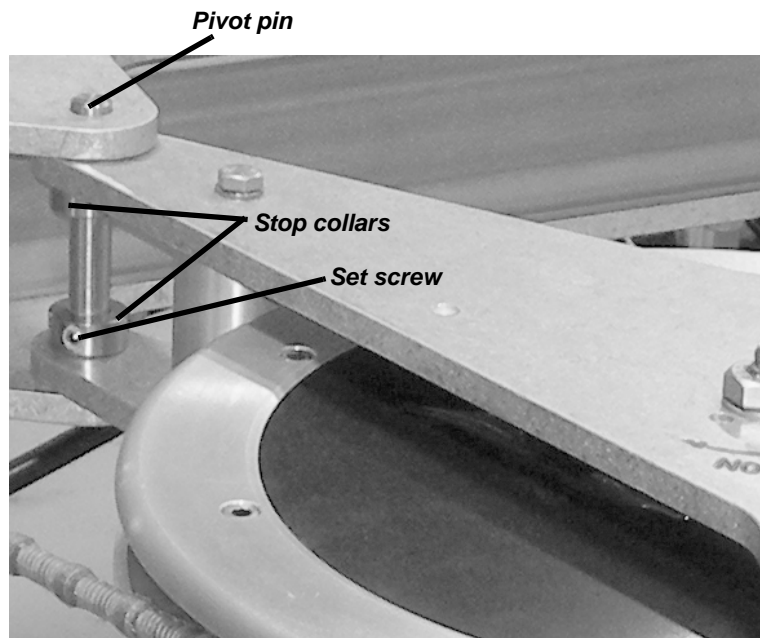


Figure 4-19. Make sure the pivot pin is through both plates, then position the stop collars and tighten the set screws.

Chapter 5

Parts List and Ordering Information

ORDERING INFORMATION

To place an order, request service, or get more detailed information on any E.H. Wachs products, call us at one of the following numbers:

U.S. 800-323-8185

International: 847-537-8800

You can also visit our Web site at:

www.ehwachs.com

Ordering Replacement Parts

When ordering parts, refer to the parts lists in this chapter. Please provide the part description and part number for all parts you are ordering.

Repair Information

Please call us for an authorization number before returning any equipment for repair or factory service. We will advise you of shipping and handling. When you send the equipment, please include the following information:

- Your name/company name
- Your address
- Your phone number

In This Chapter

ORDERING INFORMATION

PARTS LISTS AND LAYOUT
DRAWINGS

- A description of the problem or the work to be done.

Before we perform any repair, we will estimate the work and inform you of the cost and the time to complete it.

Warranty Information

Enclosed with the manual is a warranty card. Please fill out the registration card and return to E.H. Wachs. Retain the owner's registration record and warranty card for your information.

Return Goods Address

Return equipment for repair to the following address.

E.H. Wachs
600 Knightsbridge Parkway
Lincolnshire, Illinois 60069 USA

PARTS LISTS AND LAYOUT DRAWINGS

The tables on the following pages list the parts for the WS-3012, WS-3616, and WS-5230 subsea wire saws.

The drawings at the end of the chapter illustrate the layout and dimensions of the subsea wire saw models.

Alpha Rentals, L.L.C.
4706 Curtis Lane
New Iberia, LA 70560
337-367-2880 www.alpha4rentals.com

WS-3012

Manufactured Parts		
Qty.	Part No.	Description
MAIN FRAME ASSEMBLY		
2	08-011-020	TUBE, LINEAR GUIDE MOUNTING
1	08-011-021	TUBE, LINEAR GUIDE MOUNTING
3	08-011-027	PLATE, 027
2	08-011-027B	PLATE, 027B
1	08-011-028	PLATE, 028
2	08-011-029	PLATE, 029
2	08-011-201	PLATE, 201
2	08-011-201B	PLATE, 201B
2	08-011-202	PLATE, 202
2	08-011-202B	PLATE, 202B
1	08-011-203	PLATE, 203
1	08-011-203B	PLATE, 203B
2	08-011-204	ROD END, CYLINDER
4	08-011-205	BUSHING, CYLINDER
2	08-011-206	ROD, 206
2	08-011-207	ROD, 207
2	08-011-208	ROLLER
8	08-011-209	ROD, 209
2	08-011-210	TUBE, 210
6	08-011-211	BAR, 211
4	08-011-212	SPACER, 212
2	08-011-213	SPACER, 213
6	08-011-215	ROD, 215
2	08-011-220	PLATE, 220
4	08-011-221	PLATE, 221
1	08-011-222	PLATE, 222
2	08-011-223	ROD, 223
1	08-011-224	PLATE, BULKHEAD
1	08-011-224B	WELDMENT, BULKHEAD PLATE
4	08-011-230	ROD, 230
2	08-011-231	BLOCK, 231
1	08-011-242	ROD, 242
1	08-011-243	PLATE, 243
1	08-051-246	PLATE, 246
1	08-051-246B	PLATE, 246B
2	08-011-247	BAR, LIFTING
2	08-011-248	CYLINDER, CLAMP
2	08-011-250	TUBE, LIFTING
1	08-011-251	ROD, 251

2	08-011-252	PLATE, 252
2	08-011-253	PLATE, 253
2	08-011-254	CLAMP COLLAR, LIFTING FRAME
1	08-051-255	BAR, LIFTING
BOW FRAME ASSEMBLY		
2	08-011-022	TUBE, BOW FRAME
4	08-011-024	SPACER, 024
2	08-011-025	ROD, 025
1	08-011-030	PLATE, 030
1	08-011-030B	PLATE, 030B
2	08-011-031	PLATE, 031
2	08-011-031B	PLATE, 031B
2	08-051-032	PLATE, 032
1	08-011-034	PLATE, 034
2	08-011-036	NUT, TENSION
1	08-011-037	BLOCK, MOTOR ADAPTER
1	08-051-043C	PLATE, 043C
1	08-051-043D	PLATE, 043D
1	08-051-044	ROD, 044
1	08-011-062	ROD END
DRIVE / GUIDE WHEEL ASSEMBLIES		
1	08-011-050	HUB, DRIVE WHEEL
1	08-011-051	MOUNT, BEARING
3	08-011-052	HUB, WHEEL
1	08-011-053A	PLATE, 053A
1	08-011-053B	WHEEL, PLATE 053B
1	08-011-053C	WHEEL, PLATE 053C
1	08-011-053D	WHEEL, PLATE 053D
1	08-011-053E	WHEEL, PLATE 053E
6	08-011-054A	WHEEL, PLATE 054A
3	08-011-054B	WHEEL, PLATE 054B
1	08-011-055	TUBE, 055
2	08-011-056	TUBE, 056
1	08-011-057	SCREW, 057 WHEEL
2	08-011-058	SCREW, 058 WHEEL
1	08-011-059	SCREW, 059 WHEEL
6	08-011-063	RETAINER, DRIVEN WHEEL SEAL
1	08-011-064	RETAINER, DRIVE WHEEL SEAL
2	08-011-720	GRIP, WHEEL
3	08-011-730	GRIP, WHEEL IDLER
3	08-011-730B	PLATE, 730B
FEED ASSEMBLY		
1	06-052-150	HOUSING, FEED BOX OUTPUT
1	06-052-155	COUPLING MATEX MOTOR
1	06-052-158	COUPLER, DRIVE

1	06-052-159	HOUSING, FEED BOX INPUT
1	06-052-160	YOKE, FEED
1	06-052-161	BUSHING, FEED CLUTCH
1	06-052-181B	SPROCKET, 2.40 x .375 PITCH
1	06-052-182	SPROCKET, 1.80 x .375 PITCH
1	06-052-333	EXTENSION, FEED BOX HOUSING
1	08-011-040	SCREW, FEED
1	08-011-041	PLATE, 041
1	08-011-042	PLATE, 042
1	08-011-043	BUSHING, FEED
1	08-011-044	NUT, FEED
1	08-011-045	BLOCK, FEED SCREW MOUNTING
2	08-011-046	BUSHING, FEED
1	08-011-047	RETAINER, SCREW
1	08-011-048	WASHER, 048
1	08-011-049	KEY, FEED SCREW
FEED TENSION-SWITCH ASSEMBLY		
1	08-011-023	ROD, 023
1	08-011-023C	ROD, 023C
2	08-011-026C	SCREW, 026
1	08-051-260	ROD, 260
1	08-051-261	ROD, 261
1	08-051-270	ROD, 270
1	08-051-271	PLATE, 271
1	08-051-272	BLOCK, 272
2	08-051-273	NUT, 273
1	08-051-274	BLOCK, 274
1	08-051-274B	BLOCK, 274B
1	08-051-275B	BLOCK, 275B
1	08-051-276	ROD, 276
1	08-051-277	BLOCK, 277
2	08-051-278	ROD, 278
1	08-051-278B	BLOCK, 278B
1	08-051-279	BLOCK, 279
DIAMOND WIRE ASSEMBLIES		
2	08-011-700	DIAMOND WIRE, 10.3 MM TYROLIT

Purchased Parts	
Qty	Description
MAIN FRAME ASSEMBLY	
1	FLOW DIVIDER
1	HYDRAULIC GEAR MOTOR
2	HYDRAULIC CYLINDER

1	HYD. ADP., 12-10 SAE-ORB TO JIC, 90 DEG.
1	HYD. ADP., 10-10 SAE-ORB TO JIC 90 DEG.
4	HYD. ADP., 10-6 SAE-ORB TO JIC 90 DEG.
1	HYD. ADP., 8-6 SAE-ORB TO JIC 90 DEG.
1	HYD. ADP., 6-6 SAE-ORB TO JIC 90 DEG.
4	HYD. ADP., 6-6 SAE ORB TO JIC STR.
2	37 DEG. BULKHEAD TEE FITTING
8	FEMALE JIC /SAE 37 DEG. SWIVEL -6
2	FEMALE JIC /SAE 37 DEG. SWIVEL -10
2	FEMALE JIC/SAE 37 DEG. SWIVEL W/45 DEG.
4	FEMALE JIC/SAE 37 DEG. SWIVEL W/90 DEG.
2	FEMALE JIC/SAE 37 DEG. SWIVEL W/90 DEG.
	3/8 HOSE, SAE100R16 TYPE S
	5/8 HOSE, SAE100R16 TYPE S
7	RETAINING RING, EXTERNAL .781 SHAFT
7	RETAINING RING, INTERNAL 1.850 HOUSING
4	CLAMP COLLAR, 1/2" ID (316 SS)
8	CLAMP COLLAR, 1-1/4" ID
8	BEARING, 20mm ID x 47mm OD x 14 mm 440 SS SINGLE SEALED
3	WASHER, THRUST 30mm ID x 47mm OD x 1mm
4	BUSHING, FLANGE 1" ID x 1-1/8" OD x 1" LNG.
4	BUSHING, FLANGE 1-1/4" ID x 1.4 OD x 1" LNG.
3	LINEAR BEARING SYSTEM (RAIL/CARRIAGE)
1	DIE SPRING, 1/2" ID x 1" OD x 12" FREE LENGTH
1	FITTING, TEE 3/8" JIC (F) x 3/8" JIC (M) x 3/8" JIC (M)
4	COUPLING, FEMALE -08 NPT
4	COUPLING, MALE -08 NPT
2	COUPLING, MALE -12 NPT
2	COUPLING, FEMALE -12 NPT
4	FITTING, BULKHEAD 1/2" NPT x 1/2" JIC
2	FITTING, BULKHEAD 3/4" NPT x 3/4" JIC
4	NUT, BULKHEAD LOCK -08
2	NUT, BULKHEAD LOCK -12
1	ROD END, BALL JOINT
4	EYEBOLT, 5/8-11
8	KNOB, 1/2-13
2	ZINC ANODE, 2" DIA.
3	5/8" ANCHOR SHACKLE, W/ SCREW PIN
FEED SCREW ASSEMBLY	
1	HYDRAULIC MOTOR
1	SNAP RING (3/4" O.D. SHAFT)
1	SNAP RING (1-5/8" I.D. BORE)
1	CLAMP ON COLLAR, 3/4-16 (303 SS)
1	BEARING (.75 x 1.625 x .438)
4	WASHER, BELLEVILLE SPRING 2" OD x 1" ID x .065 THICK

2	PLANET SET (3:1)
2	PLANET SPACER
1	PLANET SET (4:1)
2	KEYWAY 3/16" x 3/4" LNG. ROUND ENDS
1	KEYWAY, 1/8" x 1" LNG. ROUND ENDS
4	STANDOFF, 3/8" OD x 5/8" LNG. (SPECIFY 10-24 THD)
24"	#35 CHAIN (SS) (34 links long)
1	#35 CHAIN CONNECTING LINK
2	FEMALE JIC /SAE 37 DEG. SWIVEL -6
FEED TENSION-SWITCH ASSEMBLY	
1	DIRECTIONAL CONTROL VALVE
4	FITTING, 1/4" TUBE x 1/8" NPT (M)
2	FITTING, TEE 1/4" TUBE (F) x 1/4" TUBE (F) x 1/8" NPT (M)
2	FITTING, TEE 1/8" NPT (F) x 1/8" NPT (F) x 1/8" NPT (M)
2	BALL VALVE, 1/8" NPT (F) x 1/8" NPT (F)
1	FITTING, 1/8" NPT (M) x 3/8" HOSE BARB
12"	TUBING, 3/8" CLEAR PVC
1	FITTING, 1/8" NPT (F) x 3/8" HOSE BARB
2	FITTING, TEE 1/8" NPT (F) x 1/8" NPT (F) x 1/8" NPT (F)
4	FITTING, 1/8" NPT (M) x 1/4" JIC (M)
4	AIR VENT, 1/8" NPT (M)
2	TUBE CLAMP, 5/8"
2	CRIMP FITTING, -4 HOSE x -4 JIC (F)
1	CRIMP FITTING, -4 HOSE x -4 JIC (F) x 45 DEG.
1	CRIMP FITTING, -4 HOSE x -4 JIC (F) x 90 DEG.
	HOSE, 1/4"
2	Check Valve, 3/8"
1	FITTING, -4 SAE (M) x -6 JIC (M) 90 DEG.
2	Fitting, 3/8" JIC (F) x 3/8" JIC (F)
1	Fitting, Tee 3/8" JIC (M) x 3/8" JIC (M) x 1/4" ORB (M)
2	Fitting, Tee 3/8" JIC (M) x 3/8" JIC (M) x 1/4" ORB (M)
1	CRIMP FITTING, -6 HOSE x -8 JIC (F)
2	CRIMP FITTING, -6 HOSE x -6 JIC (F) x 90 DEG.
5	CRIMP FITTING, -6 HOSE x -6 JIC (F)
	HOSE, 3/8"
1	SPRING, .72 OD, x .586 ID x 2" LNG.
2	CYLINDER, 2.5" STROKE

Fasteners	
Qty	Description
MAIN FRAME ASSEMBLY	
72	FHCS, 1/4-20 x 5/8" LNG.
30	FHCS, 5/16-18 x 3/4" LNG.

16	FHCS, 3/8-16 x 1-1/4" LNG.
12	FHCS, 3/8-16 x 2-1/4" LNG.
32	FHCS, 5/8-11 x 1-1/2" LNG.
4	HHCS, 1/4-20 x 1/2" LNG.
20	HHCS, 1/4-20 x 5/8" LNG.
4	HHCS, 1/4-20 x 1-1/4" LNG.
8	HHCS, 1/4-20 x 1-1/2" LNG.
24	HHCS, 3/8-16 x 3/4" LNG.
48	HHCS, 3/8-16 x 1-1/8" LNG.
25	HHCS, 3/8-16 x 1-1/4" LNG.
2	HHCS, 3/8-16 x 1-3/8" LNG.
6	HHCS, 3/8-16 x 2-1/4" LNG.
1	HHCS, 3/8-16 x 4-1/2" LNG.
4	HHCS, 7/16-14 x 2" LNG.
24	HHCS, 7/16-14 x 3" LNG.
4	HHCS, 1/2-13 x 1-1/8" LNG.
4	HHCS, 1/2-13 x 1-1/4" LNG.
4	HHCS, 1/2-13 x 1-1/2" LNG.
3	HHCS, 1/2-13 x 2-1/4" LNG.
1	HHCS, 1/2-13 x 2-3/4" LNG.
2	HHCS, 1/2-13 x 3-3/4" LNG.
16	HHCS, 5/8-11 x 1-1/2" LNG.
1	HHCS, 5/8-11 x 1-3/4" LNG.
4	HHCS, 5/8-11 x 2-1/4" LNG.
4	HHCS, 5/8-11 x 2-3/4" LNG.
2	HHCS, 5/8-11 x 6" LNG.
2	HHCS, 3/4-10 x 2" LNG.
12	HHCS, M10 x 45 LNG.
4	SHCS, 1/4-20 x 3/4" LNG.
1	SHCS, 1/4-20 x 7/8" LNG.
24	SHCS, 1/4-20 x 1-1/4" LNG.
12	SHCS, 1/4-20 x 5/8" LNG.
6	SHCS, 5/16-18 x 5/8 LNG.
42	SHCS, 5/16-18 x 1-1/4" LNG.
2	SHCS, 7/16-14 x 1" LNG.
8	SSS, CUP POINT 1/4-20 x 7/8" LNG.
7	NUT, NYLOCK 1/4-20
54	NUT, NYLOCK 5/16-18
107	NUT, NYLOCK 3/8-16
16	NUT, NYLOCK 7/16-14
6	NUT, NYLOCK 1/2-13
8	NUT, NYLOCK 5/8-11
35	PIN, DOWEL 1/4" DIA. X 5/8" LNG.
3	PIN, DOWEL 1/4" DIA. X 7/8" LNG.
2	PIN, DOWEL 5/16" DIA. X 1" LNG.

2	PIN, DOWEL 5/16" DIA. X 1-1/2" LNG.
2	PIN, SPRING 3/16" DIA. X 3/4" LNG.
2	PIN, HAIRPIN COTTER .177 DIA. X 3-1/4" LNG.
2	STUD, 5/8-11 x 2-1/2" LNG.
24	WASHER, 1/4" AN
42	WASHER, 5/16 AN
183	WASHER, 3/8" AN
50	WASHER, 7/16" AN
24	WASHER, 1/2" AN
28	WASHER, 5/8" AN
2	WASHER, 3/4" AN
12	WASHER, 10 MM
4	ZERK, GREASE (303 SS)
2	ZERK, GREASE 1/4-28 (303 SS)
FEED SCREW ASSEMBLY FASTENERS	
4	HHCS, 3/8-16 x 1" LNG.
6	HHCS, 3/8-16 x 1-1/8" LNG.
7	SHCS, 8-32 x 3" LNG.
4	SHCS, 10-24 x 1-1/2" LNG.
6	SHCS, 1/4-28 x 5/8" LNG.
4	HHCS, 5/16-18 X 5/8" LNG.
1	SSS, 1/4-20 x 3/4" LNG.
1	SSS, CUP POINT 5/16-18 x 1/4" LNG.
1	SSS, CUP POINT 5/16-18 x 1" LNG.
1	PLUG, PIPE 1/8" NPT (316 SS)
1	NUT, NYLOCK 1/4-20
6	NUT, NYLOCK 3/8-16
1	PIN, SPRING 3/32" DIA x 3/8" LNG (420 SS)
1	PIN, CLEVIS 1/4" OD x 1-1/2" LNG. (316SS)
2	PIN, DOWEL 1/4" DIA. X 5/8" LNG.
1	PIN, DOWEL 1/4" DIA. X 1-3/8" LNG.
3	ZERK, GREASE 1/4-28 (303 SS)
14	WASHER, 3/8" AN
FEED RELIEF ASSEMBLY FASTENERS	
8	SHCS, 8-32 x 5/8" LNG.
1	SHCS, 1/4-28 x 1" LNG.
1	SHCS, 1/4-28 x 1-1/2" LNG.
2	SHCS, 1/4-28 x 5/8" LNG.
1	WASHER, 1/2" 18-8 SS
2	SHOULDER BOLT, 1/2" DIA. X 1" LNG.
3	SHCS, 10-24 x 5/8" LNG.
1	FHCS, 1/4-28 x 1" LNG.
1	PIN, DOWEL 3/16" DIA. X 1-1/4" LNG.

1	SSS, 1/4-20 x 3/8" LNG.
2	SHCS, 1/4-20 x 1" LNG.
2	SHCS, 1/4-20 x 1" LNG.
2	HHCS, 5/16-18 x 3/4" LNG.
4	SHCS, 8-32 x 3/4" LNG.

WS-3616

Manufactured Parts		
Qty.	Part No.	Description
MAIN FRAME ASSEMBLY		
2	08-051-020	TUBE, LINEAR GUIDE MOUNTING
1	08-051-021	TUBE, LINEAR GUIDE MOUNTING
3	08-011-027	PLATE, 027
2	08-011-027B	PLATE, 027B
1	08-011-028	PLATE, 028
2	08-011-029	PLATE, 029
2	08-051-201	PLATE, 201
2	08-051-201B	PLATE, 201B
2	08-051-202	PLATE, 202
2	08-051-202B	PLATE, 202B
1	08-051-203	PLATE, 203
1	08-051-203B	PLATE, 203B
2	08-011-204	ROD END, CYLINDER
4	08-011-205	BUSHING, CYLINDER
2	08-011-206	ROD, 206
2	08-011-207	ROD, 207
2	08-011-208	ROLLER
9	08-011-209	ROD, 209
2	08-011-210	TUBE, 210
6	08-051-211	BAR, 211
4	08-011-212	SPACER, 212
2	08-011-213	SPACER, 213
6	08-011-215	ROD, 215
2	08-051-220	PLATE, 220
4	08-051-221	PLATE, 221
1	08-051-222	PLATE, 222
2	08-051-223	ROD, 223
1	08-051-224	PLATE, BULKHEAD

1	08-051-224B	WELDMENT, BULKHEAD PLATE
4	08-011-230	ROD, 230
2	08-011-231	BLOCK, 231
1	08-051-242	ROD, 242
1	08-011-243	PLATE, 243
1	08-051-246	PLATE, 246
1	08-051-246B	PLATE, 246B
2	08-051-247	BAR, LIFTING
2	08-051-248	CYLINDER, CLAMP
2	08-051-250	TUBE, LIFTING
1	08-011-251	ROD, 251
2	08-011-252	PLATE, 252
2	08-011-253	PLATE, 253
2	08-011-254	CLAMP COLLAR, LIFTING FRAME
1	08-051-255	BAR, LIFTING
BOW FRAME ASSEMBLY		
2	08-051-022	TUBE, BOW FRAME
4	08-011-024	SPACER, 024
2	08-011-025	ROD, 025
1	08-051-030C	PLATE, 030C
1	08-051-030D	PLATE, 030D
2	08-051-031C	PLATE, 031
2	08-051-031D	PLATE, 031B
2	08-051-032	PLATE, 032
1	08-051-034	PLATE, 034
1	08-011-036	NUT, TENSION
1	08-051-037	BLOCK, MOTOR ADAPTER
2	08-051-038	TUBE, 038
1	08-051-043C	PLATE, 043C
1	08-051-043D	PLATE, 043D
1	08-051-044	ROD, 044
1	08-011-062	ROD END
DRIVE / GUIDE WHEEL ASSEMBLIES		
1	08-051-050	HUB, DRIVE WHEEL
1	08-011-051	MOUNT, BEARING
3	08-011-052	HUB, WHEEL
1	08-011-053A	PLATE, 053A
1	08-011-053B	WHEEL, PLATE 053B
1	08-011-053C	WHEEL, PLATE 053C
1	08-011-053D	WHEEL, PLATE 053D
1	08-011-053E	WHEEL, PLATE 053E
6	08-011-054A	WHEEL, PLATE 054A
3	08-011-054B	WHEEL, PLATE 054B

1	08-011-055	TUBE, 055
2	08-011-056	TUBE, 056
1	08-011-057	SCREW, 057 WHEEL
2	08-011-058	SCREW, 058 WHEEL
1	08-011-059	SCREW, 059 WHEEL
6	08-011-063	RETAINER, DRIVEN WHEEL SEAL
1	08-011-064	RETAINER, DRIVE WHEEL SEAL
2	08-011-720	GRIP, WHEEL
3	08-011-730	GRIP, WHEEL IDLER
3	08-011-730B	WHEEL, PLATE, 730B
FEED ASSEMBLY		
1	06-052-150	HOUSING, FEED BOX OUTPUT
1	06-052-155	COUPLING MATEX MOTOR
1	06-052-158	COUPLER, DRIVE
1	06-052-159	HOUSING, FEED BOX INPUT
1	06-052-160	YOKE, FEED
1	06-052-161	BUSHING, FEED CLUTCH
1	06-052-181B	SPROCKET, 2.40 x .375 PITCH
1	06-052-182	SPROCKET, 1.80 x .375 PITCH
1	06-052-333	EXTENSION, FEED BOX HOUSING
1	08-051-040	SCREW, FEED
1	08-011-041	PLATE, 041
1	08-011-042	PLATE, 042
1	08-011-043	BUSHING, FEED
1	08-011-044	NUT, FEED
1	08-011-045	BLOCK, FEED SCREW MOUNTING
2	08-011-046	BUSHING, FEED
1	08-011-047	RETAINER, SCREW
1	08-011-048	WASHER, 048
1	08-011-049	KEY, FEED SCREW
FEED TENSION-SWITCH ASSEMBLY		
1	08-051-023	ROD, 023
1	08-051-023C	ROD, 023C
1	08-011-026C	ROD, 026C
1	08-051-260	BAR, 260
1	08-051-261	ROD, 261
1	08-051-270	ROD, 270
1	08-051-271	PLATE, 271
1	08-051-272	BLOCK, 272
2	08-051-273	NUT, 273
1	08-051-274	BLOCK, 274
1	08-051-274B	BLOCK, 274B
1	08-051-275B	BLOCK, 275B

1	08-051-276	ROD, 276
1	08-051-277	BLOCK, 277
2	08-051-278	ROD, 278
1	08-051-278B	BAR, 278B
1	08-051-279	BLOCK, 279
DIAMOND WIRE ASSEMBLIES		
2	08-051-700	DIAMOND WIRE, 10.3 MM TYROLIT
OPTIONAL WHEEL COVER ASSEMBLIES		
3	08-011-055B	TUBE, 055B
2	08-051-280B	COVER, DRIVE WHEEL
6	08-051-281	COVER, GUIDE WHEEL
4	08-051-282	BLOCK, 282
OPTIONAL REPLACEMENT DRIVE WHEEL GRIP KIT		
1	08-011-720	GRIP, WHEEL

Purchased Parts	
Qty	Description
MAIN FRAME ASSEMBLY	
1	FLOW DIVIDER
1	FLOW DIVIDER
2	HYDRAULIC CYLINDER
1	HYD. ADP., 20-16 SAE-ORB TO JIC, 90 DEG.
1	HYD. ADP., 16-16 SAE-ORB TO JIC 90 DEG.
4	HYD. ADP., 10-6 SAE-ORB TO JIC 90 DEG.
1	HYD. ADP., 8-6 SAE-ORB TO JIC 90 DEG.
5	HYD. ADP., 6-6 SAE ORB TO JIC STR.
2	HYD. ADP., 6-6 FJIC-MJIC 90 DEG.
2	37 DEG. BULKHEAD TEE FITTING
8	FEMALE JIC /SAE 37 DEG. SWIVEL -6
2	FEMALE JIC /SAE 37 DEG. SWIVEL -16 W/90 DEG.
3	FEMALE JIC/SAE 37 DEG. SWIVEL W/45 DEG.
4	FEMALE JIC/SAE 37 DEG. SWIVEL W/90 DEG.
2	FEMALE JIC/SAE 37 DEG. SWIVEL
20 FT	3/8 HOSE
8 FT	1" HOSE
7	RETAINING RING, EXTERNAL .781 SHAFT
7	RETAINING RING, INTERNAL 1.850 HOUSING
4	CLAMP COLLAR, 1/2" ID (316 SS)
8	CLAMP COLLAR, 1-1/4" ID

8	BEARING, 20mm ID x 47mm OD x 14 mm 440 SS SINGLE SEALED
3	WASHER, THRUST 30mm ID x 47mm OD x 1mm
4	BUSHING, FLANGE 1" ID x 1-1/8" OD x 1" LNG.
4	BUSHING, FLANGE 1-1/4" ID x 1.4 OD x 1" LNG.
3	LINEAR BEARING SYSTEM (RAIL/CARRIAGE)
1	DIE SPRING, 1/2" ID x 1" OD x 12" FREE LENGTH
1	FITTING, TEE 3/8" JIC (F) x 3/8" JIC (M) x 3/8" JIC (M)
4	COUPLING, FEMALE -08 NPT
4	COUPLING, MALE -08 NPT
2	COUPLING, MALE -16 NPT
2	COUPLING, FEMALE -16 NPT
4	FITTING, BULKHEAD 1/2" NPT x 1/2" JIC
2	FITTING, BULKHEAD 1" NPT x 1" JIC
4	NUT, BULKHEAD LOCK -08
2	NUT, BULKHEAD LOCK -16
1	ROD END, BALL JOINT
4	EYEBOLT, 5/8-11
4	KNOB, 1/2-13
2	ZINC ANODE, 2" DIA.
3	5/8" ANCHOR SHACKLE, W/ SCREW PIN
FEED SCREW ASSEMBLY	
1	HYDRAULIC MOTOR
1	SNAP RING (3/4" O.D. SHAFT)
1	SNAP RING (1-5/8" I.D. BORE)
1	CLAMP ON COLLAR, 3/4-16 (303 SS)
1	BEARING (.75 x 1.625 x .438)
4	WASHER, BELLEVILLE SPRING 2" OD x 1" ID x .065 THICK
2	PLANET SET (3:1)
2	PLANET SPACER
1	PLANET SET (4:1)
2	KEYWAY 3/16" x 3/4" LNG. ROUND ENDS
1	KEYWAY, 1/8" x 1" LNG. ROUND ENDS
4	STANDOFF, 3/8" OD x 5/8" LNG. (SPECIFY 10-24 THD)
24"	#35 CHAIN (SS) (34 links long)
1	#35 CHAIN CONNECTING LINK
2	FEMALE JIC /SAE 37 DEG. SWIVEL -6
FEED TENSION-SWITCH ASSEMBLY	
1	DIRECTIONAL CONTROL VALVE
4	FITTING, 1/4" TUBE x 1/8" NPT (M)
2	FITTING, TEE 1/4" TUBE (F) x 1/4" TUBE (F) x 1/8" NPT (M)
2	FITTING, TEE 1/8" NPT (F) x 1/8" NPT (F) x 1/8" NPT (M)
2	BALL VALVE, 1/8" NPT (F) x 1/8" NPT (F)

1	FITTING, 1/8" NPT (M) x 3/8" HOSE BARB
12"	TUBING, 3/8" CLEAR PVC
1	FITTING, 1/8" NPT (F) x 3/8" HOSE BARB
2	FITTING, TEE 1/8" NPT (F) x 1/8" NPT (F) x 1/8" NPT (F)
4	FITTING, 1/8" NPT (M) x 1/4" JIC (M)
4	AIR VENT, 1/8" NPT (M)
2	TUBE CLAMP, 5/8"
2	CRIMP FITTING, -4 HOSE x -4 JIC (F)
1	CRIMP FITTING, -4 HOSE x -4 JIC (F) x 45 DEG.
1	CRIMP FITTING, -4 HOSE x -4 JIC (F) x 90 DEG.
	HOSE, 1/4"
2	Check Valve, 3/8"
1	FITTING, -4 SAE (M) x -6 JIC (M) 90 DEG.
2	Fitting, 3/8" JIC (F) x 3/8" JIC (F)
1	Fitting, Tee 3/8" JIC (M) x 3/8" JIC (M) x 1/4" ORB (M)
2	Fitting, Tee 3/8" JIC (M) x 3/8" JIC (M) x 1/4" ORB (M)
1	CRIMP FITTING, -6 HOSE x -8 JIC (F)
2	CRIMP FITTING, -6 HOSE x -6 JIC (F) x 90 DEG.
5	CRIMP FITTING, -6 HOSE x -6 JIC (F)
	HOSE, 3/8"
1	SPRING, .72 OD, x .586 ID x 2" LNG.
2	CYLINDER, 2.5" STROKE
OPTIONAL WHEEL COVER ASSEMBLIES	
6	SPACER, .328 ID x .875 OD x .06-.066 THICK

Fasteners	
Qty	Description
MAIN FRAME ASSEMBLY	
72	FHCS, 1/4-20 x 5/8" LNG.
18	FHCS, 5/16-18 x 3/4" LNG.
18	FHCS, 3/8-16 x 1-1/4" LNG.
12	FHCS, 3/8-16 x 2-1/4" LNG.
32	FHCS, 5/8-11 x 1-1/2" LNG.
4	HHCS, 1/4-20 x 1/2" LNG.
20	HHCS, 1/4-20 x 5/8" LNG.
4	HHCS, 1/4-20 x 5/8" LNG.
8	HHCS, 1/4-20 x 1-1/2" LNG.
2	HHCS, 5/16-18 x 3/4" LNG.
4	HHCS, 3/8-16 x 3/4" LNG.
48	HHCS, 3/8-16 x 1-1/8" LNG.

22	HHCS, 3/8-16 x 1-1/4" LNG.
2	HHCS, 3/8-16 x 1-3/8" LNG.
6	HHCS, 3/8-16 x 2-1/4" LNG.
2	HHCS, 3/8-16 x 4-1/2" LNG.
24	HHCS, 7/16-14 x 3" LNG.
4	HHCS, 1/2-13 x 1-1/8" LNG.
2	HHCS, 1/2-13 x 1-1/4" LNG.
4	HHCS, 1/2-13 x 1-1/2" LNG.
1	HHCS, 1/2-13 x 2-3/4" LNG.
2	HHCS, 1/2-13 x 3-3/4" LNG.
18	HHCS, 5/8-11 x 1-1/2" LNG.
1	HHCS, 5/8-11 x 1-3/4" LNG.
4	HHCS, 5/8-11 x 2-1/4" LNG.
2	HHCS, 5/8-11 x 2-3/4" LNG.
2	HHCS, 5/8-11 x 6" LNG.
2	HHCS, 3/4-10 x 2" LNG.
12	HHCS, M10 x 45 LNG.
4	SHCS, 1/4-20 x 3/4" LNG.
1	SHCS, 1/4-20 x 7/8" LNG.
8	SHCS, 1/4-20 x 1-1/4" LNG.
4	SHCS, 1/4-20 x 5/8" LNG.
6	SHCS, 5/16-18 x 5/8 LNG.
45	SHCS, 5/16-18 x 1-1/4" LNG.
8	SSS, CUP POINT 1/4-20 x 7/8" LNG.
7	NUT, NYLOCK 1/4-20
45	NUT, NYLOCK 5/16-18
106	NUT, NYLOCK 3/8-16
16	NUT, NYLOCK 7/16-14
7	NUT, NYLOCK 1/2-13
6	NUT, NYLOCK 5/8-11
33	PIN, DOWEL 1/4" DIA. X 5/8" LNG.
3	PIN, DOWEL 1/4" DIA. X 7/8" LNG.
2	PIN, DOWEL 5/16" DIA. X 1" LNG.
2	PIN, DOWEL 5/16" DIA. X 1-1/2" LNG.
2	PIN, HAIRPIN COTTER .177 DIA. X 3-1/4" LNG.
2	STUD, 5/8-11 x 2-1/2" LNG.
24	WASHER, 1/4" AN
45	WASHER, 5/16 AN
90	WASHER, 3/8" AN
50	WASHER, 7/16" AN
28	WASHER, 1/2" AN
30	WASHER, 5/8" AN
2	WASHER, 3/4" AN

12	WASHER, 10 MM
4	ZERK, GREASE (303 SS)
2	ZERK, GREASE 1/4-28 (303 SS)
FEED SCREW ASSEMBLY FASTENERS	
4	HHCS, 3/8-16 x 1" LNG.
6	HHCS, 3/8-16 x 1-1/8" LNG.
7	SHCS, 8-32 x 3" LNG.
4	SHCS, 10-24 x 1-1/2" LNG.
6	SHCS, 1/4-28 x 5/8" LNG.
4	HHCS, 5/16-18 X 5/8" LNG.
1	SSS, 1/4-20 x 3/4" LNG.
1	SSS, CUP POINT 5/16-18 x 1/4" LNG.
1	SSS, CUP POINT 5/16-18 x 1" LNG.
1	PLUG, PIPE 1/8" NPT (316 SS)
1	NUT, NYLOCK 1/4-20
6	NUT, NYLOCK 3/8-16
1	PIN, SPRING 3/32" DIA x 3/8" LNG (420 SS)
1	PIN, CLEVIS 1/4" OD x 1-1/2" LNG. (316 SS)
2	PIN, DOWEL 1/4" DIA. X 5/8" LNG.
1	PIN, DOWEL 1/4" DIA. X 1-3/8" LNG.
3	ZERK, GREASE 1/4-28 (303 SS)
12	WASHER, 3/8" AN
FEED RELIEF ASSEMBLY FASTENERS	
8	SHCS, 8-32 x 5/8" LNG.
1	SHCS, 1/4-28 x 1" LNG.
1	SHCS, 1/4-28 x 1-1/2" LNG.
2	SHCS, 1/4-28 x 5/8" LNG.
1	WASHER, 1/2" 18-8 SS
2	SHOULDER BOLT, 1/2" DIA. X 1" LNG.
3	SHCS, 10-24 x 5/8" LNG.
1	FHCS, 1/4-28 x 1" LNG.
1	PIN, DOWEL 3/16" DIA. X 1-1/4" LNG.
1	SSS, 1/4-20 x 3/8" LNG.
2	SHCS, 1/4-20 x 1" LNG.
2	SHCS, 1/4-20 x 1" LNG.
2	HHCS, 5/16-18 x 3/4" LNG.
4	SHCS, 8-32 x 3/4" LNG.
OPTIONAL WHEEL COVER ASSEMBLIES	
6	FHCS, 5/16-18 x 1" LNG.
6	NUT, NYLOCK 5/16-18
12	FHCS, 1/4-20 x 1/2" LNG.
OPTIONAL REPLACEMENT DRIVE WHEEL GRIP KIT	
8	SHCS, 1/4-20 x 1-1/4" LNG.

WS-5230

Manufactured Parts		
Qty.	Part No.	Description
MAIN FRAME ASSEMBLY		
2	08-021-020	TUBE, LINEAR GUIDE MOUNTING
1	08-021-021	TUBE, LINEAR GUIDE MOUNTING
3	08-011-027	PLATE, 027
2	08-011-027B	PLATE, 027B
1	08-011-028	PLATE, 028
2	08-011-029	PLATE, 029
2	08-021-201	PLATE, 201
2	08-021-201B	PLATE, 201B
2	08-021-202	PLATE, 202
2	08-021-202B	PLATE, 202B
1	08-021-203	PLATE, 203
1	08-021-203B	PLATE, 203B
2	08-021-204	ROD END, CYLINDER
4	08-011-205	BUSHING, CYLINDER
2	08-011-206	ROD, 206
2	08-011-207	ROD, 207
2	08-011-208	ROLLER
14	08-011-209	ROD, 209
2	08-011-210	TUBE, 210
2	08-021-211	BAR, 211
6	08-011-212	SPACER, 212
4	08-011-213	SPACER, 213
4	08-021-214	BAR, 214
6	08-011-215	ROD, 215
2	08-021-220	PLATE, 220
4	08-051-221	PLATE, 221
1	08-021-222	PLATE, 222
2	08-021-223	ROD, 223
1	08-021-224	PLATE, BULKHEAD
1	08-021-224B	WELDMENT, BULKHEAD PLATE
4	08-011-230	ROD, 230
2	08-021-231	BLOCK, 231
1	08-021-242	ROD, 242
1	08-021-243	PLATE, 243
1	08-021-246	PLATE, 246

1	08-021-246B	PLATE, 246B
2	08-021-247	BAR, LIFTING
2	08-021-248	CYLINDER, CLAMP
2	08-021-250	TUBE, LIFTING
1	08-011-251	ROD, 251
2	08-011-252	PLATE, 252
2	08-011-253	PLATE, 253
2	08-011-254	CLAMP COLLAR, LIFTING FRAME
1	08-051-255	BAR, LIFTING
BOW FRAME ASSEMBLY		
2	08-021-022	TUBE, BOW FRAME
4	08-011-024	SPACER, 024
2	08-011-025	ROD, 025
1	08-021-030	PLATE, 030
1	08-021-030B	PLATE, 030B
2	08-021-031	PLATE, 031
2	08-021-031B	PLATE, 031B
4	08-021-032	PLATE, 032
2	08-051-032	PLATE, 032
1	08-021-034	PLATE, 034
1	08-011-036	NUT, TENSION
1	08-051-037	BLOCK, MOTOR ADAPTER
2	08-021-038	PLATE, 038
4	08-021-039	BAR, 039
1	08-051-043C	PLATE, 043C
1	08-051-043D	PLATE, 043D
1	08-051-044	ROD, 044
1	08-011-062	ROD END
DRIVE / GUIDE WHEEL ASSEMBLIES		
1	08-051-050	HUB, DRIVE WHEEL
1	08-011-051	MOUNT, BEARING
3	08-011-052	HUB, WHEEL
1	08-011-053A	PLATE, 053A
1	08-011-053B	WHEEL, PLATE 053B
1	08-011-053C	WHEEL, PLATE 053C
1	08-011-053D	WHEEL, PLATE 053D
1	08-011-053E	WHEEL, PLATE 053E
6	08-011-054A	WHEEL, PLATE 054A
3	08-011-054B	WHEEL, PLATE 054B
1	08-011-055	TUBE, 055
2	08-011-056	TUBE, 056
1	08-011-057	SCREW, 057 WHEEL
2	08-011-058	SCREW, 058 WHEEL

1	08-011-059	SCREW, 059 WHEEL
6	08-011-063	RETAINER, DRIVEN WHEEL SEAL
1	08-011-064	RETAINER, DRIVE WHEEL SEAL
2	08-011-720	GRIP, WHEEL
3	08-011-730	GRIP, WHEEL IDLER
3	08-011-730B	WHEEL, PLATE, 730B
FEED ASSEMBLY		
1	06-052-150	HOUSING, FEED BOX OUTPUT
1	06-052-155	COUPLING MATEX MOTOR
1	06-052-158	COUPLER, DRIVE
1	06-052-159	HOUSING, FEED BOX INPUT
1	06-052-160	YOKE, FEED
1	06-052-161	BUSHING, FEED CLUTCH
1	06-052-181B	SPROCKET, 2.40 x .375 PITCH
1	06-052-182	SPROCKET, 1.80 x .375 PITCH
1	06-052-333	EXTENSION, FEED BOX HOUSING
1	08-021-040	SCREW, FEED
1	08-011-041	PLATE, 041
1	08-011-042	PLATE, 042
1	08-011-043	BUSHING, FEED
1	08-011-044	NUT, FEED
1	08-011-045	BLOCK, FEED SCREW MOUNTING
2	08-011-046	BUSHING, FEED
1	08-011-047	RETAINER, SCREW
1	08-011-048	WASHER, 048
1	08-011-049	KEY, FEED SCREW
FEED TENSION-SWITCH ASSEMBLY		
1	08-051-023	ROD, 023
1	08-051-023C	ROD, 023C
1	08-011-026C	ROD, 026C
1	08-051-260	BAR, 260
1	08-051-261	ROD, 261
1	08-051-270	ROD, 270
1	08-051-271	PLATE, 271
1	08-051-272	BLOCK, 272
2	08-051-273	NUT, 273
1	08-051-274	BLOCK, 274
1	08-051-274B	BLOCK, 274B
1	08-051-275B	BLOCK, 275B
1	08-051-276	ROD, 276
1	08-051-277	BLOCK, 277
2	08-051-278	ROD, 278
1	08-051-278B	BAR, 278B

1	08-051-279	BLOCK, 279
DIAMOND WIRE ASSEMBLIES		
2	08-021-700	DIAMOND WIRE, 10.3 MM TYROLIT
OPTIONAL WHEEL COVER ASSEMBLIES		
3	08-011-055B	TUBE, 055B
2	08-051-280B	COVER, DRIVE WHEEL
6	08-051-281	COVER, GUIDE WHEEL
4	08-051-282	BLOCK, 282
OPTIONAL REPLACEMENT DRIVE WHEEL GRIP KIT		
1	08-011-720	GRIP, WHEEL

Purchased Parts	
Qty	Description
MAIN FRAME ASSEMBLY	
1	FLOW DIVIDER
1	HYDRAULIC GEAR MOTOR
2	HYDRAULIC CYLINDER
	HYDRAULIC CYLINDER CONTINUED
1	HYD. ADP., 20-16 SAE-ORB TO JIC, 90 DEG.
1	HYD. ADP., 16-16 SAE-ORB TO JIC 90 DEG.
4	HYD. ADP., 10-6 SAE-ORB TO JIC 90 DEG.
1	HYD. ADP., 8-6 SAE-ORB TO JIC 90 DEG.
5	HYD. ADP., 6-6 SAE ORB TO JIC STR.
2	HYD. ADP., 6-6 FJIC-MJIC 90 DEG.
8	FEMALE JIC /SAE 37 DEG. SWIVEL -6
2	FEMALE JIC /SAE 37 DEG. SWIVEL -16 W/90 DEG.
3	FEMALE JIC/SAE 37 DEG. SWIVEL W/45 DEG.
4	FEMALE JIC/SAE 37 DEG. SWIVEL W/90 DEG.
2	FEMALE JIC/SAE 37 DEG. SWIVEL
20 FT	3/8 HOSE
8 FT	1" HOSE
7	RETAINING RING, EXTERNAL .781 SHAFT
7	RETAINING RING, INTERNAL 1.850 HOUSING
4	CLAMP COLLAR, 1/2" ID (316 SS)
8	CLAMP COLLAR, 1-1/4" ID
8	BEARING, 20mm ID x 47mm OD x 14 mm 440 SS SINGLE SEALED
3	WASHER, THRUST 30mm ID x 47mm OD x 1mm
4	BUSHING, FLANGE 1" ID x 1-1/8" OD x 1" LNG.
4	BUSHING, FLANGE 1-1/4" ID x 1.4 OD x 1" LNG.
3	LINEAR BEARING SYSTEM (RAIL/CARRIAGE)

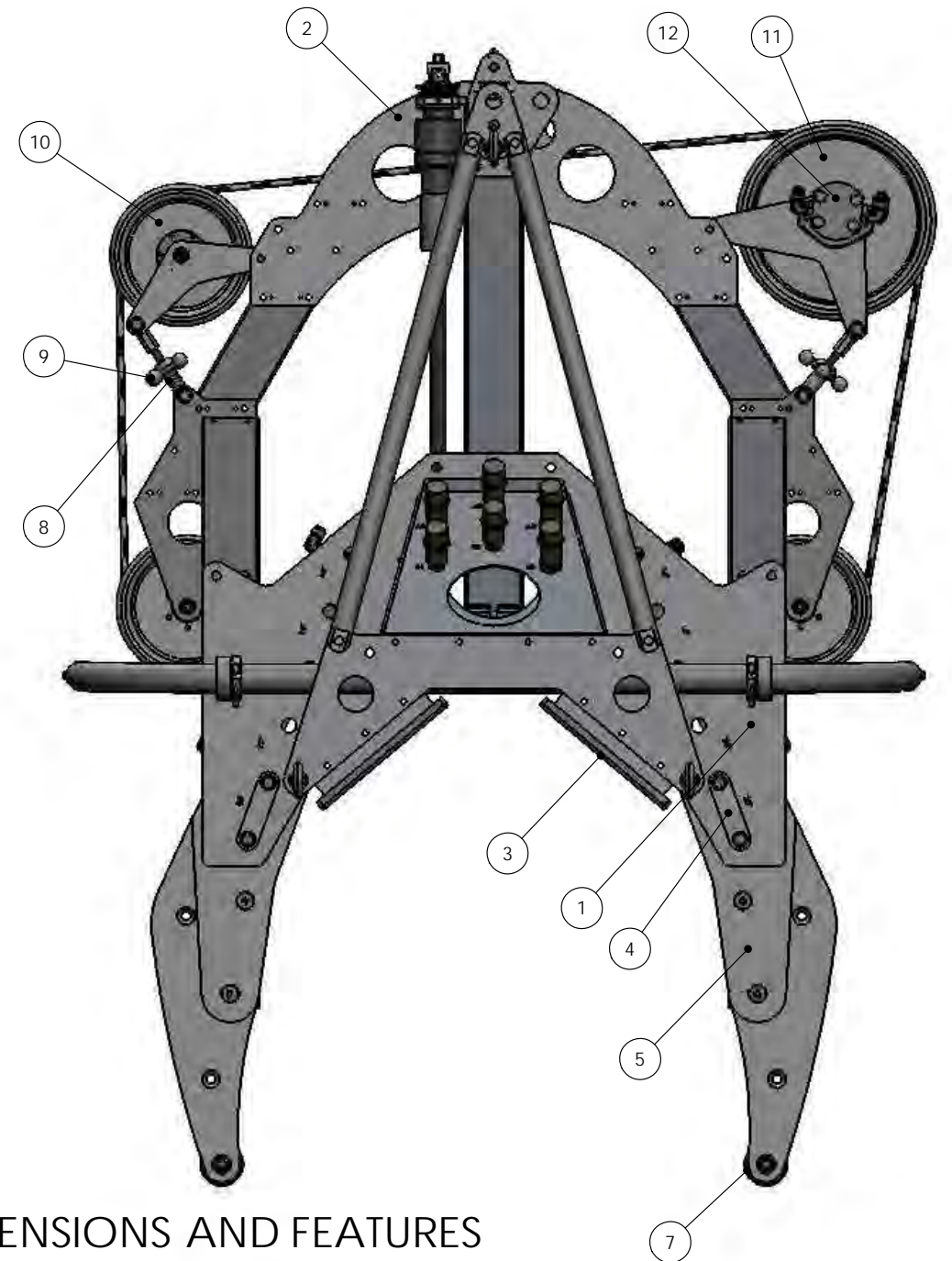
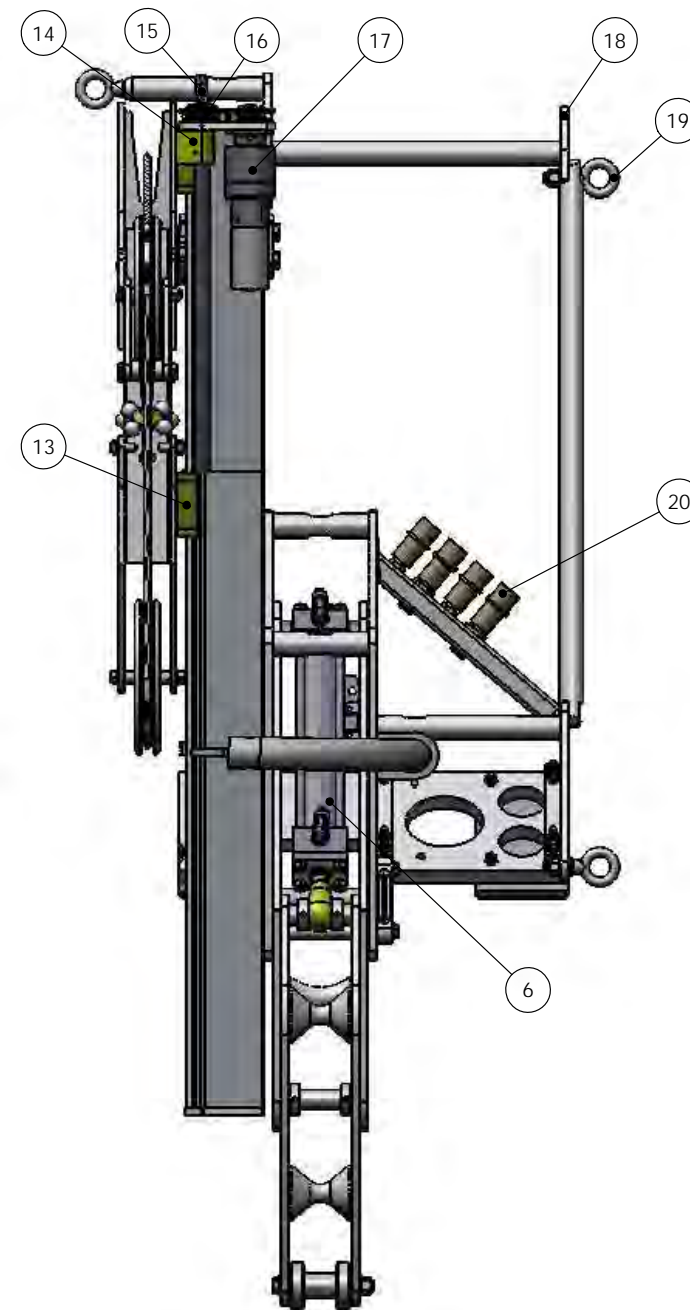
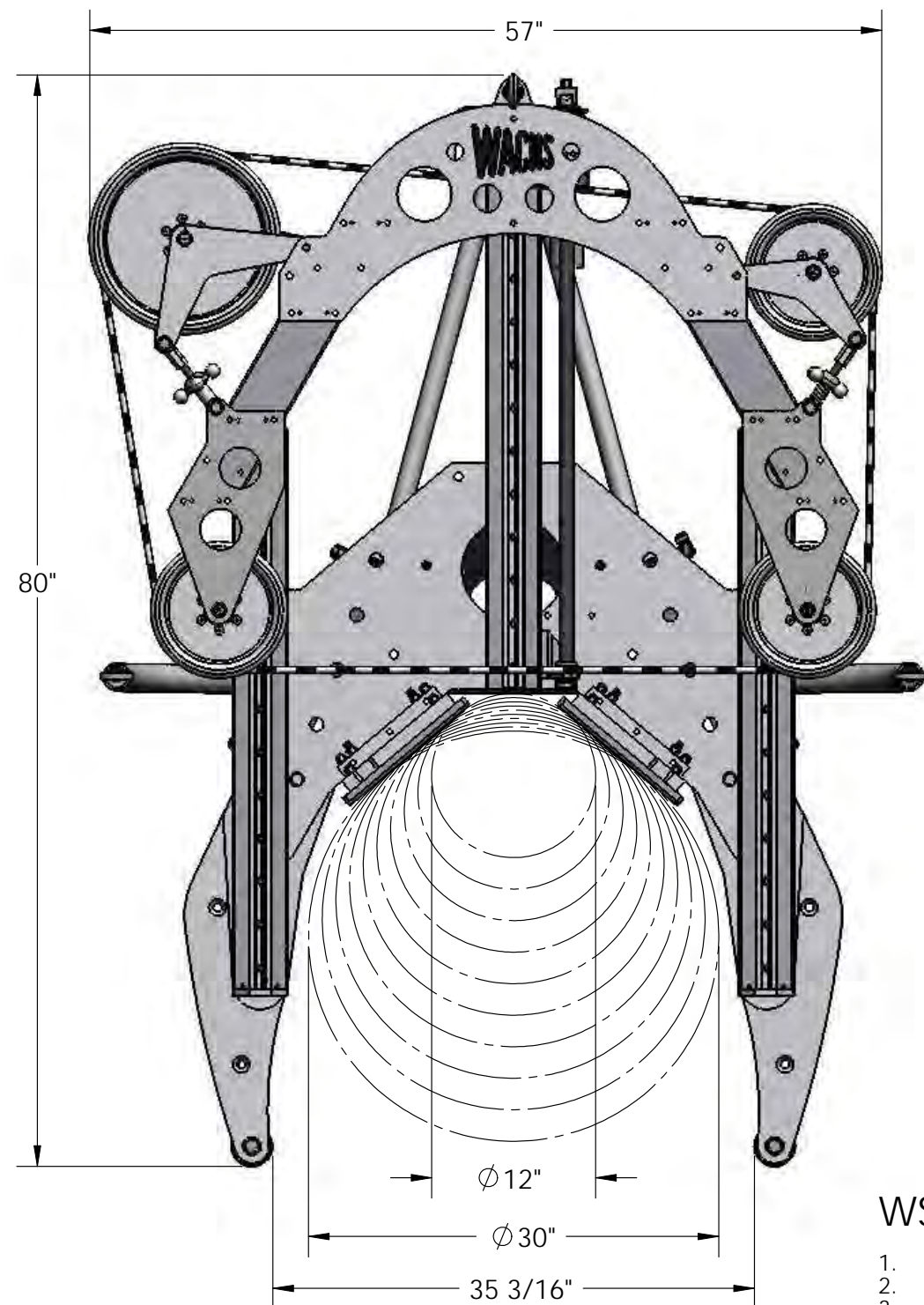
1	DIE SPRING, 1/2" ID x 1" OD x 12" FREE LENGTH
4	COUPLING, FEMALE -08 NPT
4	COUPLING, MALE -08 NPT
2	COUPLING, MALE -16 NPT
2	COUPLING, FEMALE -16 NPT
4	FITTING, BULKHEAD 1/2" NPT x 1/2" JIC
2	FITTING, BULKHEAD 1" NPT x 1" JIC
4	NUT, BULKHEAD LOCK -08
2	NUT, BULKHEAD LOCK -16
1	FITTING, TEE 3/8" JIC (F) x 3/8" JIC (M) x 3/8" JIC (M)
2	37 DEG. BULKHEAD TEE FITTING
1	ROD END, BALL JOINT (TAP 1/2-13 UNC 2B THD.)
4	EYEBOLT, 5/8-11
4	KNOB, 1/2-13
2	ZINC ANODE, 2" DIA.
3	5/8" ANCHOR SHACKLE, W/ SCREW PIN
FEED SCREW ASSEMBLY	
1	HYDRAULIC MOTOR
1	SNAP RING (3/4" O.D. SHAFT)
1	SNAP RING (1-5/8" I.D. BORE)
1	CLAMP ON COLLAR, 3/4-16 (303 SS)
1	BEARING (.75 x 1.625 x .438)
4	WASHER, BELLEVILLE SPRING 2" OD x 1" ID x .065 THICK
2	PLANET SET (3:1)
2	PLANET SPACER
1	PLANET SET (4:1)
2	KEYWAY 3/16" x 3/4" LNG. ROUND ENDS
1	KEYWAY, 1/8" x 1" LNG. ROUND ENDS
4	STANDOFF, 3/8" OD x 5/8" LNG. (SPECIFY 10-24 THD)
24"	#35 CHAIN (SS) (34 links long)
1	#35 CHAIN CONNECTING LINK
2	FEMALE JIC /SAE 37 DEG. SWIVEL -6
FEED TENSION-SWITCH ASSEMBLY	
1	DIRECTIONAL CONTROL VALVE
4	FITTING, 1/4" TUBE x 1/8" NPT (M)
2	FITTING, TEE 1/4" TUBE (F) x 1/4" TUBE (F) x 1/8" NPT (M)
2	FITTING, TEE 1/8" NPT (F) x 1/8" NPT (F) x 1/8" NPT (M)
2	BALL VALVE, 1/8" NPT (F) x 1/8" NPT (F)
1	FITTING, 1/8" NPT (M) x 3/8" HOSE BARB
12"	TUBING, 3/8" CLEAR PVC
1	FITTING, 1/8" NPT (F) x 3/8" HOSE BARB
2	FITTING, TEE 1/8" NPT (F) x 1/8" NPT (F) x 1/8" NPT (F)
4	FITTING, 1/8" NPT (M) x 1/4" JIC (M)

4	AIR VENT, 1/8" NPT (M)
2	TUBE CLAMP, 5/8"
2	CRIMP FITTING, -4 HOSE x -4 JIC (F)
1	CRIMP FITTING, -4 HOSE x -4 JIC (F) x 45 DEG.
1	CRIMP FITTING, -4 HOSE x -4 JIC (F) x 90 DEG.
	HOSE, 1/4"
2	Check Valve, 3/8"
1	FITTING, -4 SAE (M) x -6 JIC (M) 90 DEG.
2	Fitting, 3/8" JIC (F) x 3/8" JIC (F)
1	Fitting, Tee 3/8" JIC (M) x 3/8" JIC (M) x 1/4" ORB (M)
2	Fitting, Tee 3/8" JIC (M) x 3/8" JIC (M) x 1/4" ORB (M)
1	CRIMP FITTING, -6 HOSE x -8 JIC (F)
2	CRIMP FITTING, -6 HOSE x -6 JIC (F) x 90 DEG.
5	CRIMP FITTING, -6 HOSE x -6 JIC (F)
	HOSE, 3/8"
1	SPRING, .72 OD, x .586 ID x 2" LNG.
2	CYLINDER, 2.5" STROKE
OPTIONAL WHEEL COVER ASSEMBLIES	
6	SPACER, .328 ID x .875 OD x .06-.066 THICK

Fasteners	
Qty	Description
MAIN FRAME ASSEMBLY	
72	FHCS, 1/4-20 x 5/8" LNG. (18-SS)
12	FHCS, 5/16-18 x 3/4" LNG. (18-8 SS)
4	FHCS, 3/8-16 x 1-1" LNG. (18-8 SS)
16	FHCS, 3/8-16 x 1-1/4" LNG. (18-8 SS)
2	FHCS, 3/8-16 x 2-1/4" LNG. (18-8 SS)
40	FHCS, 5/8-11 x 1-1/2" LNG. (18-8 SS)
4	HHCS, 1/4-20 x 1/2" LNG.
20	HHCS 1/4-20 x 5/8" LNG. (18-8 SS)
4	HHCS, 1/4-20 x 1-1/4" LNG. (18-8 SS)
8	HHCS, 1/4-20 x 1-1/2" LNG. (18-8 SS)
2	HHCS, 5/16-18 x 3/4" LNG.
4	HHCS, 3/8-16 x 3/4" LNG. (18-8 SS)
72	HHCS, 3/8-16 x 1-1/8" LNG. (18-8 SS)
33	HHCS, 3/8-16 x 1-1/4" LNG. (18-8 SS)
2	HHCS, 3/8-16 x 1-3/8" LNG. (18-8 SS)
18	HHCS, 3/8-16 x 2-1/4" LNG. (18-8 SS)
2	HHCS, 3/8-16 x 4-1/2" LNG. (18-8 SS)

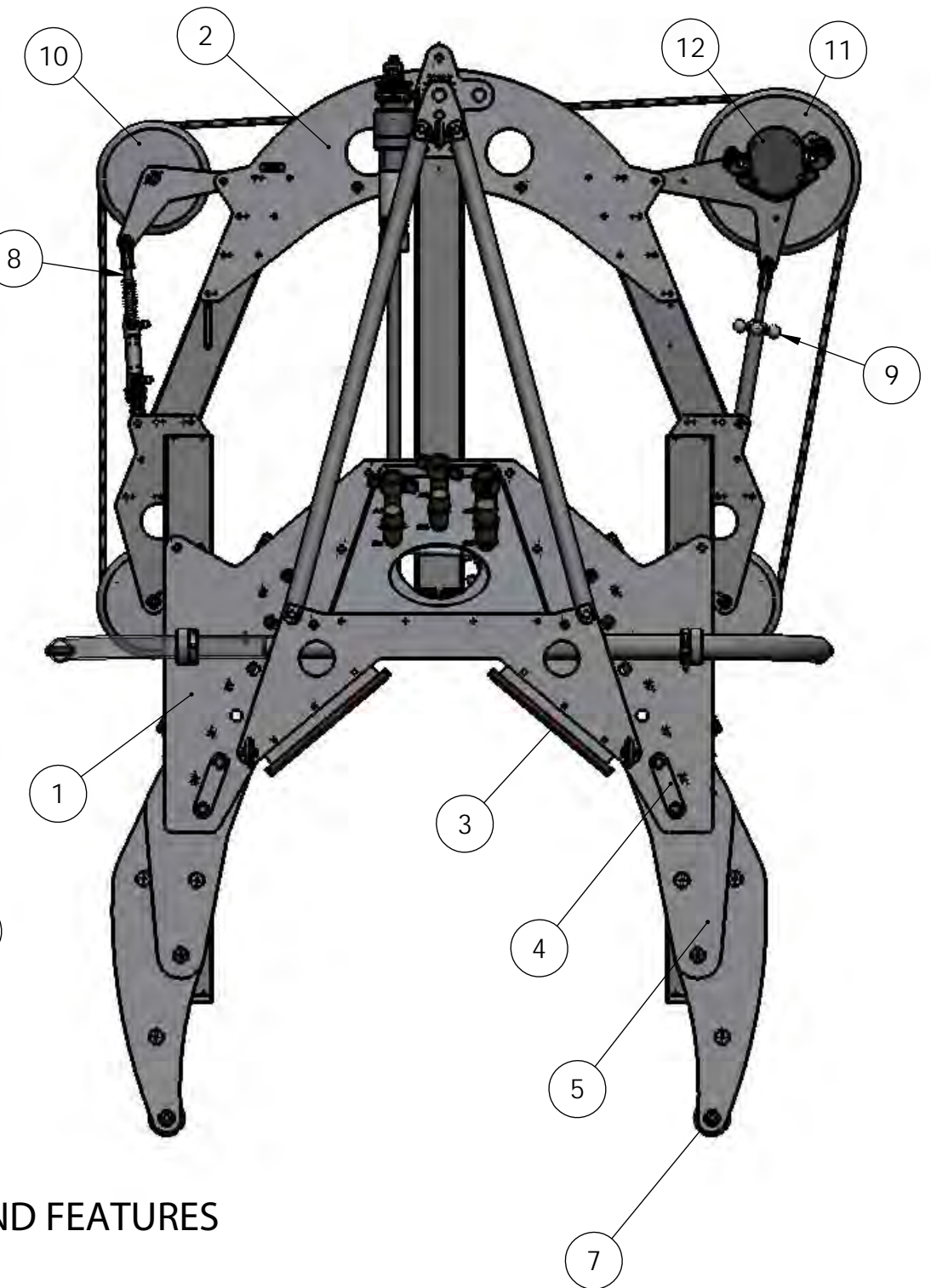
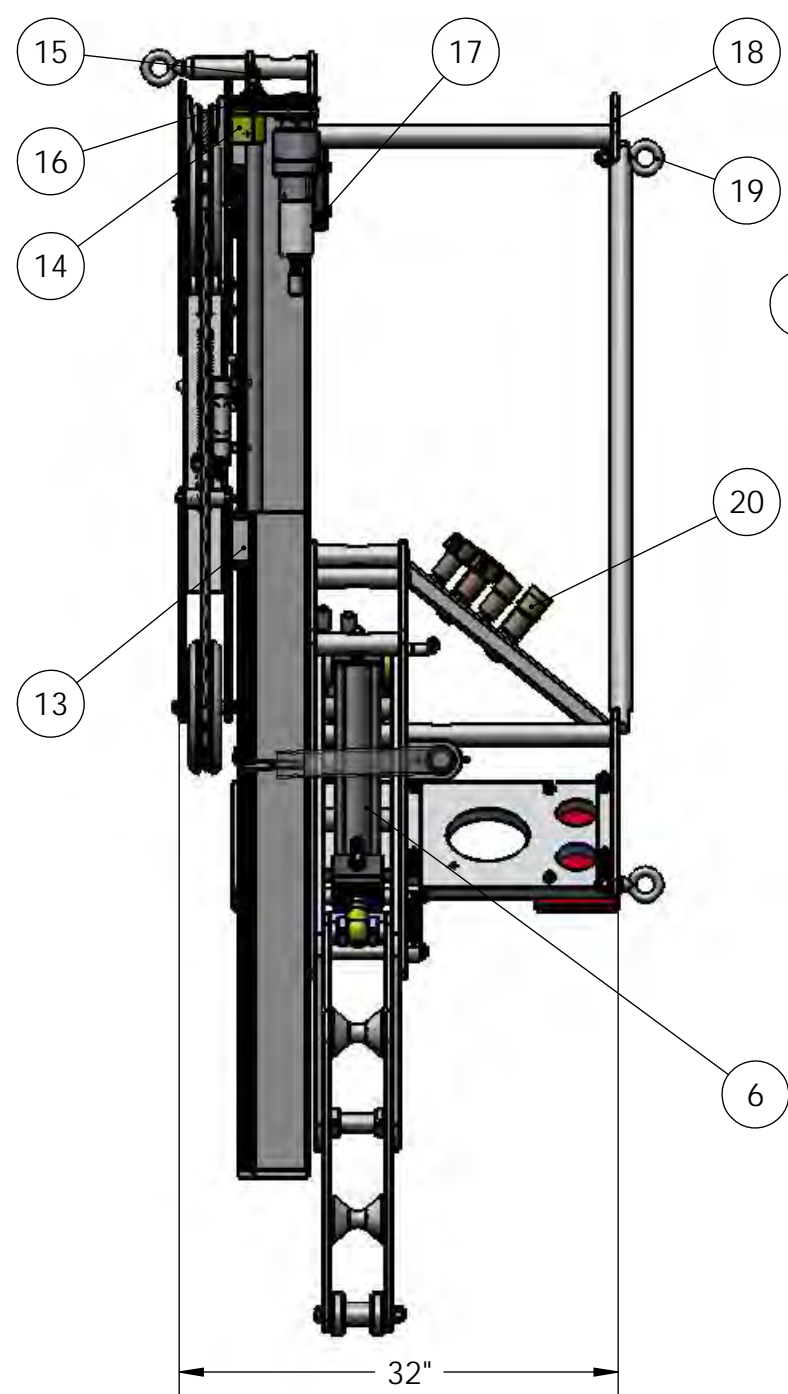
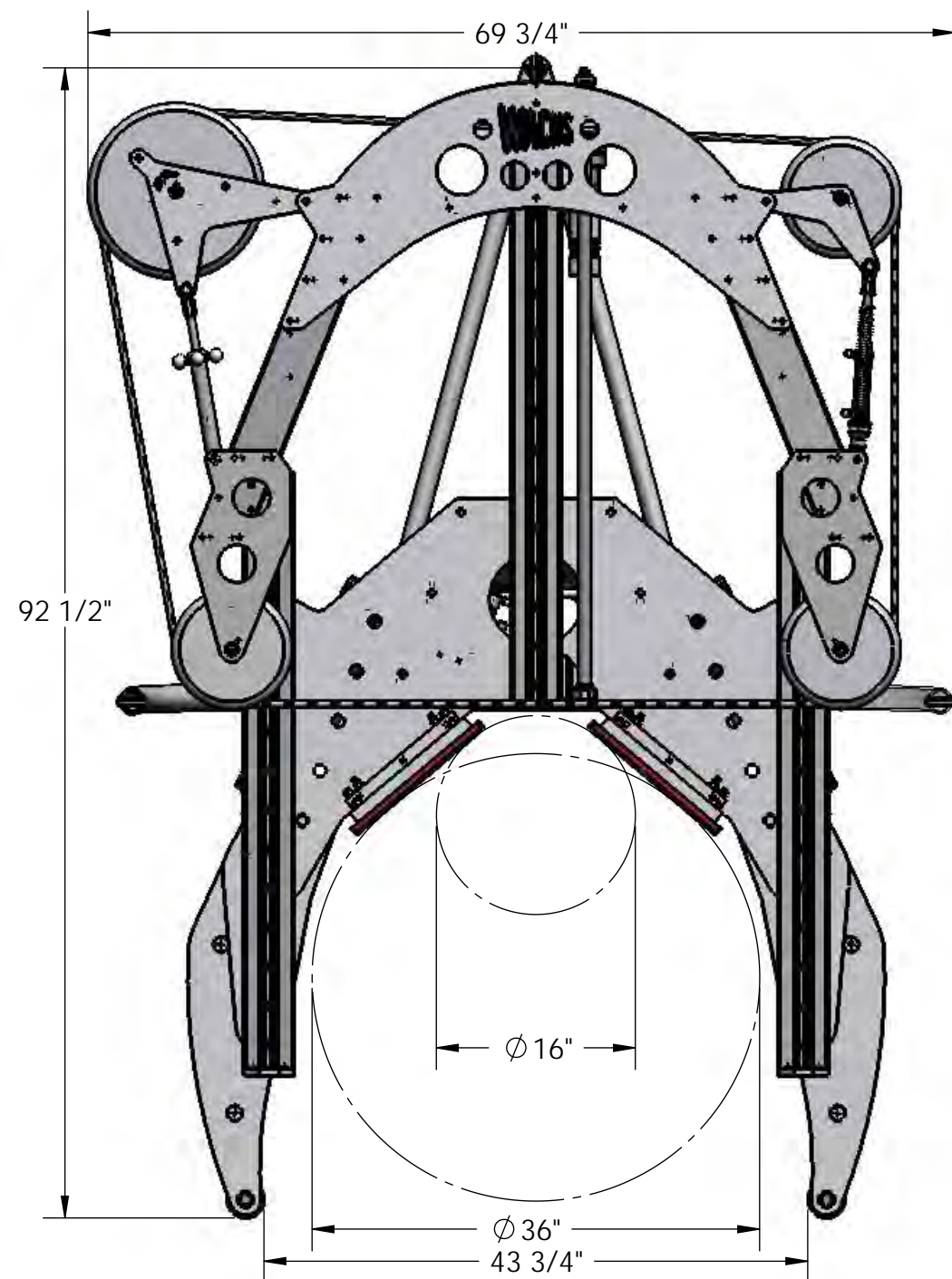
24	HHCS, 7/16-14 x 3" LNG. (18-8 SS)
4	HHCS, 1/2-13 x 1-1/8" LNG. (18-8 SS)
2	HHCS, 1/2-13 x 1-1/4" LNG. (18-8 SS)
4	HHCS, 1/2-13 x 1-1/2" LNG. (18-8 SS)
1	HHCS, 1/2-13 x 2-3/4" LNG. (18-8 SS)
2	HHCS, 1/2-13 x 3-3/4" LNG. (18-8 SS)
28	HHCS, 5/8-11 x 1-1/2" LNG. (18-8 SS)
1	HHCS, 5/8-11 x 1-3/4" LNG. (18-8 SS)
4	HHCS, 5/8-11 x 2-1/4" LNG. (18-8 SS)
4	HHCS, 5/8-11 x 2-3/4" LNG. (18-8 SS)
2	HHCS, 5/8-11 x 6" LNG. (18-8 SS)
2	HHCS, 3/4-10 x 2" LNG. (18-8 SS)
12	HHCS, M10 x 45 LNG. (18-8 SS)
4	SHCS, 1/4-20 x 3/4" LNG.
2	SHCS, 1/4-20 x 7/8" LNG.
8	SHCS, 1/4-20 x 1-1/4" LNG.
4	SHCS, 1/4-20 x 5/8" LNG.
6	SHCS, 5/16-18 X 5/8" LNG.
63	SHCS, 5/16-18 x 1-1/4" LNG. (18-8 SS)
4	SSS, CUP POINT 1/4-20 x 7/8" LNG. (18-8 SS)
8	NUT, NYLOCK 1/4-20 (18-8 SS)
65	NUT, NYLOCK 5/16-18 (18-8 SS)
127	NUT, NYLOCK 3/8-16 (18-8 SS)
32	NUT, NYLOCK 7/16-14 (18-8 SS)
7	NUT, NYLOCK 1/2-13 (18-8 SS)
13	NUT, NYLOCK 5/8-11 (18-8 SS)
6	PIN, DOWEL 1/8" DIA. X 1/2" LNG.
51	PIN, DOWEL 1/4" DIA. X 5/8" LNG.
3	PIN, DOWEL 1/4" DIA. X 7/8" LNG.
2	PIN, DOWEL 5/16" DIA. X 1" LNG.
2	PIN, DOWEL 5/16" DIA. X 1-1/2" LNG.
2	PIN, HAIRPIN COTTER .177 DIA. X 3-1/4" LNG.
2	STUD, 5/8-11 x 2-1/2" LNG. (18-8 SS)
36	WASHER, 1/4" AN (18-8 SS)
63	WASHER, 5/16 AN (18-8 SS)
186	WASHER, 3/8" AN (18-8 SS)
64	WASHER, 7/16" AN (18-8 SS)
28	WASHER, 1/2" AN (18-8 SS)
43	WASHER, 5/8" AN (18-8 SS)
2	WASHER, 3/4" AN (18-8 SS)
12	WASHER, 10 MM (18-8 SS)
4	ZERK, GREASE (303 SS)
2	ZERK, GREASE 1/4-28 (303 SS)

FEED SCREW ASSEMBLY - FASTENERS	
4	HHCS, 3/8-16 x 1" LNG. (18-8 SS)
6	HHCS, 3/8-16 x 1-1/8" LNG. (18-8 SS)
7	SHCS, 8-32 x 3" LNG. (18-8 SS)
4	SHCS, 10-24 x 1-1/2" LNG. (18-8 SS)
6	SHCS, 1/4-28 x 5/8" LNG. (18-8 SS)
4	HHCS, 5/16-18 X 5/8" LNG. (18-8 SS)
1	SSS, 1/4-20 x 3/4" LNG. (18-8 SS)
1	SSS, CUP POINT 5/16-18 x 1/4" LNG. (18-8 SS)
1	SSS, CUP POINT 5/16-18 x 1" LNG. (18-8 SS)
1	PLUG, PIPE 1/8" NPT (316 SS)
1	NUT, NYLOCK 1/4-20 (18-8 SS)
6	NUT, NYLOCK 3/8-16 (18-8 SS)
1	PIN, SPRING 3/32" DIA x 3/8" LNG (420 SS)
1	PIN, CLEVIS 1/4" OD x 1-1/2" LNG. (316SS)
2	PIN, DOWEL 1/4" DIA. X 5/8" LNG.
1	PIN, DOWEL 1/4" DIA. X 1-3/8" LNG.
3	ZERK, GREASE 1/4-28 (303 SS)
12	WASHER, 3/8" AN (18-8 SS)
FEED RELIEF ASSEMBLY - FASTENERS	
8	SHCS, 8-32 x 1" LNG.
2	SHCS, 1/4-28 x 5/8" LNG.
1	WASHER, 1/2" 18-8 SS
2	SHOULDER BOLT, 1/2" DIA. X 1" LNG.
3	SHCS, 10-24 x 5/8" LNG.
1	FHCS, 1/4-28 x 1" LNG.
1	PIN, DOWEL 3/16" DIA. X 1-1/4" LNG.
1	SSS, 1/4-20 x 3/8" LNG.
1	SHCS, 1/4-28 x 1-1/2" LNG.
2	SHCS, 1/4-20 x 1" LNG.
2	HHCS, 5/16-18 x 3/4" LNG.
4	SHCS, 8-32 x 3/4" LNG.
OPTIONAL WHEEL COVER ASSEMBLIES	
6	FHCS, 5/16-18 x 1" LNG.
6	NUT, NYLOCK 5/16-18
12	FHCS, 1/4-20 x 1/2" LNG.
OPTIONAL REPLACEMENT DRIVE WHEEL GRIP KIT	
8	SHCS, 1/4-20 x 1-1/4" LNG.



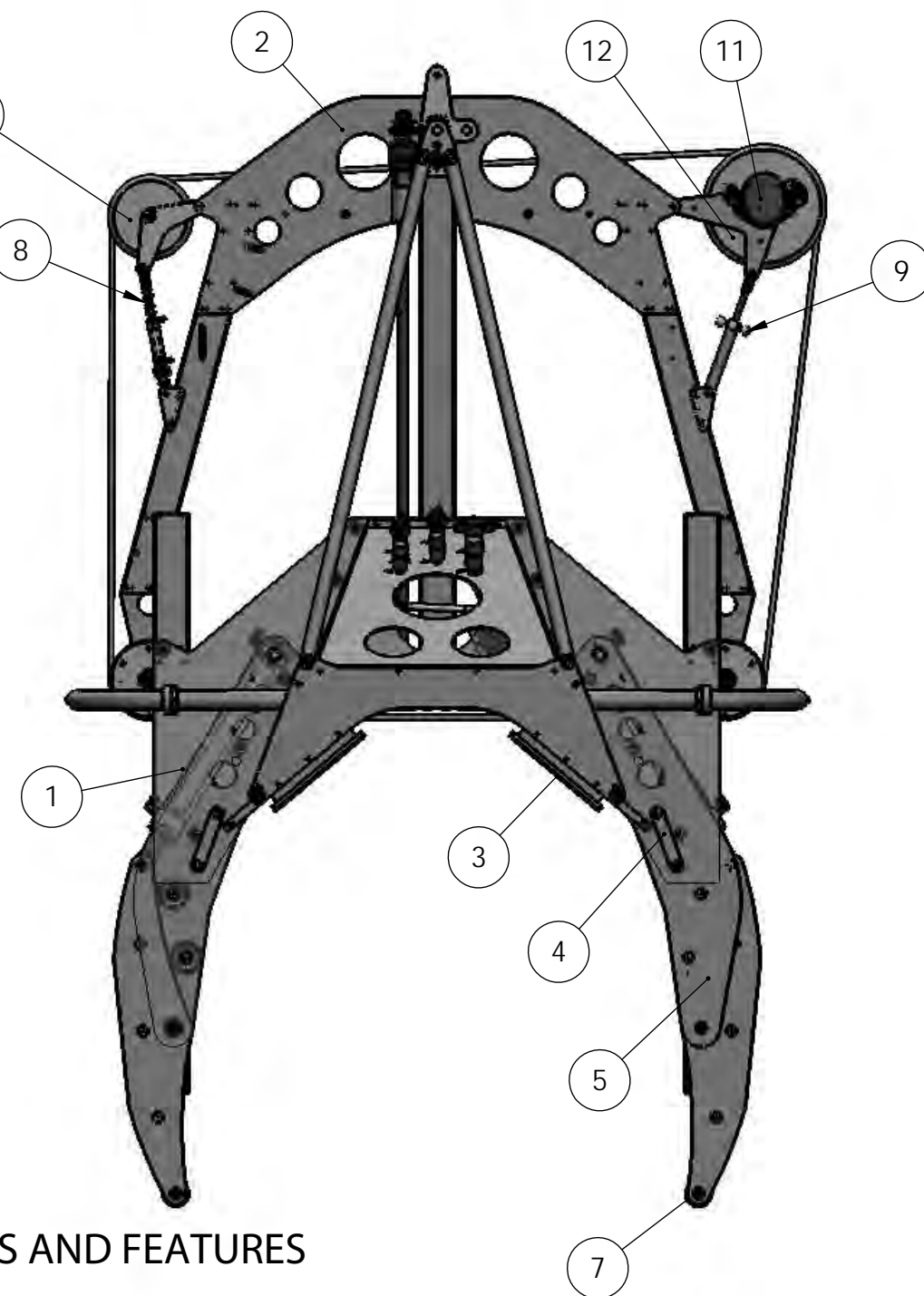
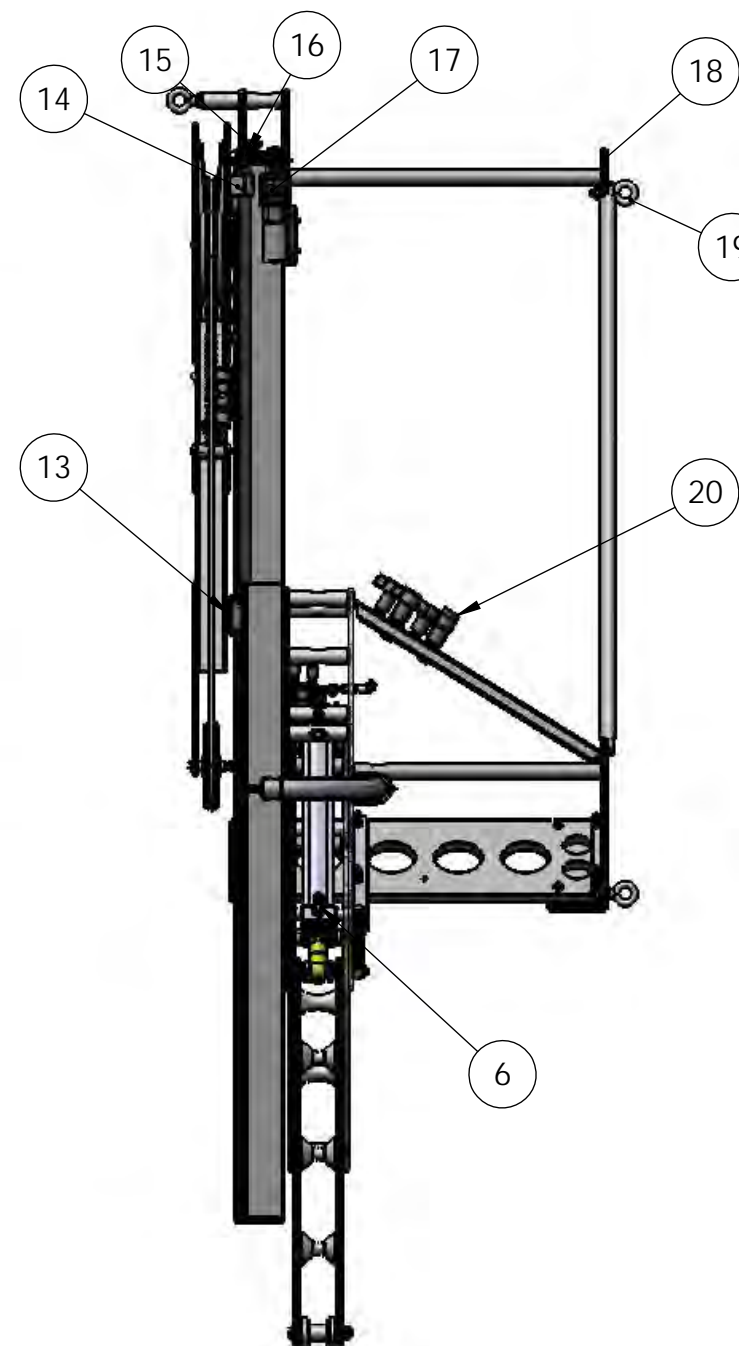
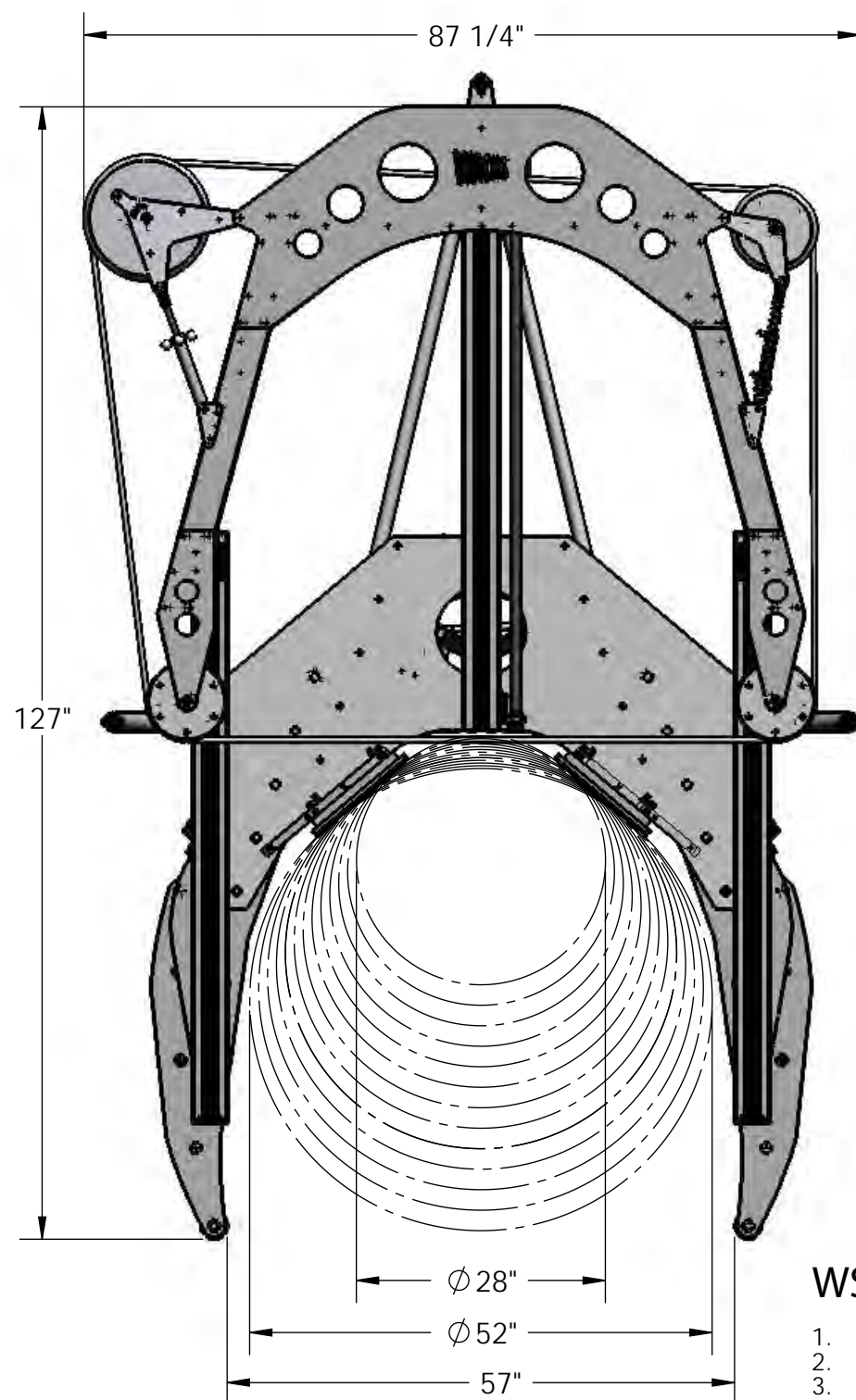
WS-3012 GENERAL ARRANGEMENT - DIMENSIONS AND FEATURES

1. Lightweight Aluminum plate/spacer frame assemblies
2. Constant tension bow feed frame module
3. Four replaceable clamp contact pads
4. Indexable clamp pin locator
5. Indexable clamp arm assembly
6. Two synchronized clamp cylinders
7. Clamp arm contact rollers
8. Wire tension spring
9. Wire tension adjustment
10. Removable wire guide wheels
11. Large diameter, high contact area, removable wire drive wheel
12. Hydraulic wire drive motor with overhung bearing support
13. Three adjustable inner guide rail assemblies
14. Single feed screw/nut assembly
15. Manual feed override lever
16. Feed overload clutch
17. Lightweight planetary feed drive
18. Lift interface for vertical cut deployment
19. Lift interface for horizontal cut deployment
20. Hydraulic interface fittings



WS-3616 GENERAL ARRANGEMENT - DIMENSIONS AND FEATURES

1. Lightweight Aluminum plate/spacer frame assemblies
2. Constant tension bow feed frame module
3. Four replaceable clamp contact pads
4. Indexable clamp pin locator
5. Indexable clamp arm assembly
6. Two synchronized clamp cylinders
7. Clamp arm contact rollers
8. Wire tension spring
9. Wire tension adjustment
10. Removable wire guide wheels
11. Large diameter, high contact area, removable wire drive wheel
12. Hydraulic wire drive motor with overhung bearing support
13. Three adjustable inner guide rail assemblies
14. Single feed screw/nut assembly
15. Manual feed override lever
16. Feed overload clutch
17. Lightweight planetary feed drive
18. Lift interface for vertical cut deployment
19. Lift interface for horizontal cut deployment
20. Hydraulic interface fittings



WS-5230 GENERAL ARRANGEMENT - DIMENSIONS AND FEATURES

1. Lightweight Aluminum plate/spacer frame assemblies
2. Constant tension bow feed frame module
3. Four replaceable clamp contact pads
4. Indexable clamp pin locator
5. Indexable clamp arm assembly
6. Two synchronized clamp cylinders
7. Clamp arm contact rollers
8. Wire tension spring
9. Wire tension adjustment
10. Removable wire guide wheels
11. Large diameter, high contact area, removable wire drive wheel
12. Hydraulic wire drive motor with overhung bearing support
13. Three adjustable inner guide rail assemblies
14. Single feed screw/nut assembly
15. Manual feed override lever
16. Feed overload clutch
17. Lightweight planetary feed drive
18. Lift interface for vertical cut deployment
19. Lift interface for horizontal cut deployment
20. Hydraulic interface fittings

